UNCLASSIFIED

NPIC DATA SYSTEM
DATA AND CONTROL SEGMENT
ACQUISITION PHASE

VOLUME III
MANAGEMENT PROPOSAL

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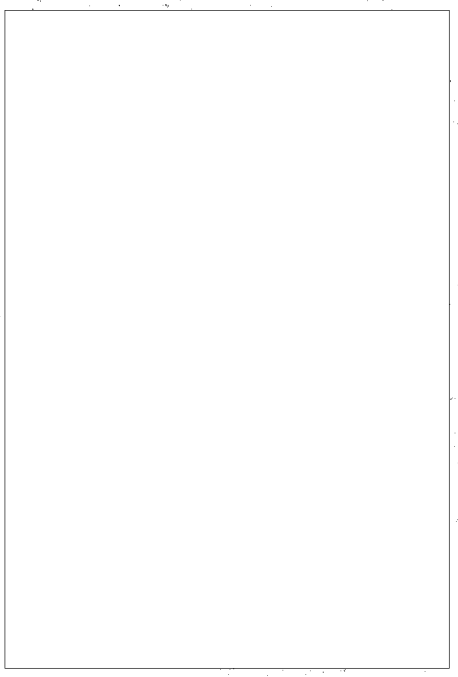

24 February 1982

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Section 1

INTRODUCTION

The NPIC Data System will undergo significant changes during the 1980s to meet the new requirements of its users. [redacted] understands the critical importance of this sy STAT to the nation's security. Two key objectives must be achieved to be successful. First, the new capabilities to support additional data sources must be delivered on time for the BOC within tight funding constraints; and second, a system concept must be provided for FOC which significantly improves the capabilities of the image analyst to perform their job easier and with greater productivity.

The [redacted] Team has the project management abilities, techniques and experience to me STAT these objectives. We have managed large complex data processing systems for other Government programs, such as Apollo, Shuttle, LAMPS and our current Data System, Modernization (DSM) and Global Positioning System (GPS) programs, and have developed the management expertise required to deliver systems within cost and on schedule.

[redacted] is highly committed to the success of the NDS program. Our project will repor STAT directly to an [redacted] Vice President to provide proper execu STAT focus and quick access to resources throughout [redacted] We have assigned one of our m STAT successful managers - [redacted] - to be the Program Manager. He has extensive STAT experience in the Intelligence Community and has managed the development of other large complex systems.

We have developed a detailed plan to staff the NDS program. All of the 166 people required at contract start have been identified and 72% either have NDS clearances or only require crossover. Also, we have identified 59 key personnel who will be included under the key personnel clause.

The required secure facilities are already under construction so that we will be ready to initiate full program activities the day of contract award.

[redacted] has teamed with three other companies which complement the [redacted] skills and brin STAT key experience to the program. [redacted] brings indep STAT knowledge and experience with NDS operations. The [redacted] STAT currently under contract to provide integrated work stations for the Navy and Army intelligence activities; they bring unique Integrated Work Station concepts to NPIC which will provide more function to the analysts thereby significantly improving their productivity. The [redacted] has performed a wide range of system conc STAT studies with Intelligence Community Staff, the DIA and other government agencies and have excellent insight into NDS requirements.

[redacted] techniques for management of large complex systems will be key to the succes STAT of the NDS D/C Segment implementation. These techniques are formulated around four concepts: (1) firm baseline points throughout the program lifecycle; (2) rigorous techniques to control changes to these baselines; (3) tracking and evaluating detailed technical status frequently; and (4) providing an on-going evaluation of the cost and schedule status of the program. Our day to day management of the program is tracked through the Program Management Control Plan (PMCP) which collects, at a detailed level, a description and schedule all project tasks and permits tracking of target and actual completion dates. Program costs are tracked through the Program

Control Management System (PCMS) which incorporates management estimates of cost to complete individual technical milestones, and provides comparison of this to the actual cost incurred. These two management tools provide key insight into program status and permit both [ ] and Government executive management good understanding of program status and direction. STAT

The key challenge of the D/C Segment schedule is the development of the BOC software. During the DCP, the [ ] team performed a comprehensive code audit of the existing system to ensure thorough understanding of the job to be performed. As a result of this audit, we have maximized retention of existing code at BOC and partitioned the CPCIs in a manner which permits parallel development without incurring risk. We have also developed ways to utilize commercially available software products to reduce the amount of software to be developed. This is the basis for our confidence that we can achieve the BOC milestone. STAT

[ ] has developed comprehensive software development methodologies and software engineering practices which have been proven successful on other large software development programs. These techniques focus on intensive reviews of individual program design and code which enables early detection of problems and significantly reduces the cost of their correction. In addition, these techniques enable the integration and testing of the software to proceed in a controlled and predictable manner. We feel our demonstrated ability in this area is the best in the industry. STAT

To facilitate the review of this proposal, a cross-referenced compliancy matrix is provided in Appendix B-4. This matrix correlates the RFP's Instructions to specific Sections in this Proposal.

Section 2

CORPORATE COMMITMENT

The [redacted] team recognizes the national importance of the NDS program to the Nation's security. We have committed the people, facilities and resources to assure successful implementation of the D/C Segment.

Success of the NPIC Data System (NDS) requires that the D/C Segment contractor understand the system's requirements and be fully prepared to assign the people, facilities, financial resources and management attention needed to achieve the program's objectives.

[redacted] wants to participate in the NDS program. The D/C Segment matches [redacted] charte STAT to undertake challenging, nationally important programs. It ties to other [redacted] pro STAT grams and objectives, and allows us to apply our skills in data base management and high speed transactions technology to the NDS problem.

We believe our record of performance on DCP has demonstrated our technical expertise, management commitment and customer responsiveness. We made all our deliveries on schedule and we showed flexibility and open-mindedness in responding to NDPO direction. Our Corporate managements are resolved to see that this dedicated commitment continues throughout SAP. Figure 2.0-1 highlights the commitments we have made to the SAP. Figure 2.0-2 makes clear the all-out support of our subcontractors.

PROJECT MANAGEMENT	[redacted]	STAT
ORGANIZATION	Dedicated Project Team; No Other Assignments.	
REPORTING	[redacted]	STAT
EXECUTIVE ATTENTION	Two Advisory Councils, Management and Technical, To Review/Advise Project; Composed Of Senior [redacted] And Subcontractor Executives.	STAT
STAFFING	380 Positions, Corresponding to Full Peak Load Requirements, Identified and Filled, By Name.	
CONSULTANTS	Imagery Analysis Authorities [redacted] Advise Staff, Particularly On Operational Issues.	STAT
CONTINUITY	Project Team Will Continue Activities Through To Contract Award, To Assure Fast, Effective Start-Up.	
INVESTMENTS	[redacted] And Subcontractors Have Invested More Than [redacted] Preparing For D/C Segment Project.	STAT
FACILITIES	New 40,000 Square Foot SCIF In Construction; To Be Occupied By May 1, 1982.	

Figure 2.0-1. Corporate Actions to Assure NDS Commitments

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[redacted] STAT

February 24, 1982

Mr. R. P. Hazzard
Director, National Photographic
Interpretation Center
Washington, D. C. 20023

Dear Mr. Hazzard:

I am pleased to commit [redacted] resources to the STAT
successful development of the NPIC Data System. We have worked for
nearly a year with your NPIC Development Program team, and we realize
the critical nature of the NPIC Data System to the nation's security.
We are also sensitive to the need for a cost-effective system solution
to your requirements.

The Data and Control Segment development activity is consistent with the
mission and experience of [redacted] I have followed STAT
the development of our approach during the Study Phase and the Design
Competition Phase and I assure you that I will continue to give the NPIC
Data System Program the highest [redacted] priority throughout the System STAT
Acquisition Phase.

I have personally selected the senior managers for the program and have
positioned the program reporting to the Vice President, Defense and
Space Systems, providing us with maximum visibility of the program
performance. [redacted] our program director, is uniquely qualified STAT
to lead our effort. He has extensive experience within the Intelligence
community. He has successfully managed the large scale software devel-
opment effort for the NASA Space Shuttle, and he is recognized widely
throughout industry for his knowledge of large on-line systems imple-
mentation.

I am completely confident that the resources of th[redacted] Corporation STAT
coupled with the skills and experience of our team members, [redacted] STAT
[redacted] provide NPIC with the capability to meet STAT
your technical, schedule and cost objectives. Our Corporations are
committed to your program and eagerly anticipate performing on it.

Sincerely,

[redacted] STAT

[redacted]

III-2-2

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[redacted] is pleased to be teamed with [redacted] on the NPIC Data Systems program. Our professional association with NPIC extends back over the last decade and our commitment to the [redacted] team has been demonstrated over this last year in the Study and Design Competition phases. [redacted] has proposed a team of highly qualified technical, management and support personnel capable of ensuring that we meet our tasked commitments on schedule and within cost.

[redacted] President of our Government Sector, and [redacted], Senior Vice President and Managing Officer of our Communications, Electronics and Intelligence Division, have been designated to be members of the Program Management Advisory Committee and Program Technical Advisory Committee, respectively. These two senior officers, in addition to approving and auditing our quality assurance program and management controls, will meet each month with [redacted], Vice President and Manager of our Intelligence Systems Practice and our NPIC Program Manager, to review the technical, cost, staffing, and schedule status. These reviews will also examine all potential areas of risk and plans for their reduction or elimination. These senior managers possess the resources and authority necessary to provide whatever is required by our program team to ensure a successful accomplishment of the critical program milestones.

[redacted] looks forward to a successful relationship with [redacted] as well as the NPIC on this program of extreme importance to the security of the United States. You have our commitment.

[redacted]

[redacted]

The [redacted] is extremely pleased to be a member of IBM's team for the National Photographic Interpretation Center Data Control Segment System Acquisition program. [redacted] recognizes that this program is critical to the National defense and is pleased to commit any and all corporate resources required to ensure its unqualified success.

This program is an extremely challenging one from the viewpoint of schedule and technical requirements, and it will require extraordinary management attention which we pledge to provide. Because the Data Control program is such a high priority effort, [redacted] makes the following specific corporate commitments:

1. [redacted] has been assigned as our full-time program manager for the duration of the project.

2. All key personnel identified in our proposal will be assigned full-time at program initiation for the duration of the contract.

3. [redacted] will report directly to [redacted] Executive Vice President and Chief Operating Officer, to ensure that he has access to the total resources of the corporation.

[redacted] has reviewed our proposal and this letter, and he fully supports these commitments. We are looking forward to working with [redacted] on the Data Control program which will enhance our continuing close working relationship on selected major command, control, communications, and intelligence programs.

Very truly yours,

[redacted]

[redacted]

[redacted] is pleased to be teamed with [redacted] as a subcontractor for the NPIC data (NDP) program. We fully appreciate the importance of this program and [redacted] is fully committed with highly qualified technical personnel and management to assist [redacted] in providing a system which will be affordable, timely, and in accordance with the user's requirement.

The NDP program manager has been positioned within [redacted] to allow the Corporate office full visibility into the program to ensure adherence to project performance, cost and schedule.

We look forward to a very successful relationship with [redacted] with our associates who are also members of your team, and with your customers on this very important and challenging program.

[redacted]

Figure 2.0-2. Subcontractors' Letters of Commitment

2.1 Corporate Structure

We have placed the project high in our Corporate organizational structures to ensure continuing executive visibility and access to Corporate resources.

CORPORATE STRUCTURE -- On programs of overriding national importance, policy is to align its Corporate resources to derive maximum benefit from our commercial and government-dedicated capabilities. For the D/C Segment, the has been assigned total responsibility for successful implementation of the project. single point of contact with NDS for all products and services, including commercial ADPE and field engineering support. President and Chief Executive Officer, has delegated to full authority to meet our commitments to NDS. Figure 2.1-1 shows the corporate relationship of divisions participating in NDS. Interdivisional documents of understanding that set forth the duties and responsibilitites of each participating division are in place to implement directions.

WITHIN THE -- We have designated the D/C Segment project as a Systems Integration Unit (SIU) program, a special category we reserve for top priority programs. Of the some 100 ongoing projects, only five are SIU: the Air Force DSP, GPS, and DSM programs, the Navy LAMPS program and the FAA Air Traffic Control System. The D/C Segment project manager, directs a fully dedicated team and reports directly to Vice President of Defense and Space Systems. Figure 2.1-2 shows the D/C Segment Project within This reporting structure assures enhanced executive level management focus on NDS, improved division management understanding of NDS status, and more rapid availability of division and corporate resources to address NDS issues.

We have established a tailored project organization structure for NDS. As the Project Manager, [redacted] is the single individual responsible and accountable for the performance of the [redacted] Team. He is the primary management interface to the NDPO and he directs and controls all program activities. Section 3.1 contains a detailed description of the D/C Segment organization. STAT STAT

[redacted] STAT

SUBCONTRACTOR CORPORATE STRUCTURE -- Our subcontractors have similarly positioned their own projects to emphasize management visibility and access to Corporate resources. Figure 2.1-3 shows the high level reporting relationships they have established. Each D/C Segment Project manager reports directly to a senior vice president. These Vice Presidents serve on one of the Advisory Councils, described below.

ADVISORY COUNCILS -- To provide continuing overview of NDS status, each company has designated senior executives to serve on two advisory councils. As shown in Figure 2.1-4, the Management Advisory Council (MAC) will be chaired by [redacted] STAT and the Technical Advisory Council (TAC) will be chaired by [redacted] STAT Vice President. The MAC will concentrate on areas of resources availability and on management performance that might impact cost and schedule commitments. It is responsible for validating that the project manager has the resources he requires and that he and his team use them effectively. It will assist in detecting major problems early enough to prevent or minimize program impact. MAC will meet formally two or three times a year, or more often at [redacted] discretion. [redacted] will report the work of the council to the NDPO. Between meetings, the Council members meet informally. STAT

The Technical Advisory Council (TAC) will focus on significant issues of technical approach and implementation. TAC meetings will be scheduled to provide maximum support to major NDPO design reviews. We have used Advisory Councils on our DSM contract and have found them to be effective. They help executive managers, the performing team and the customer.

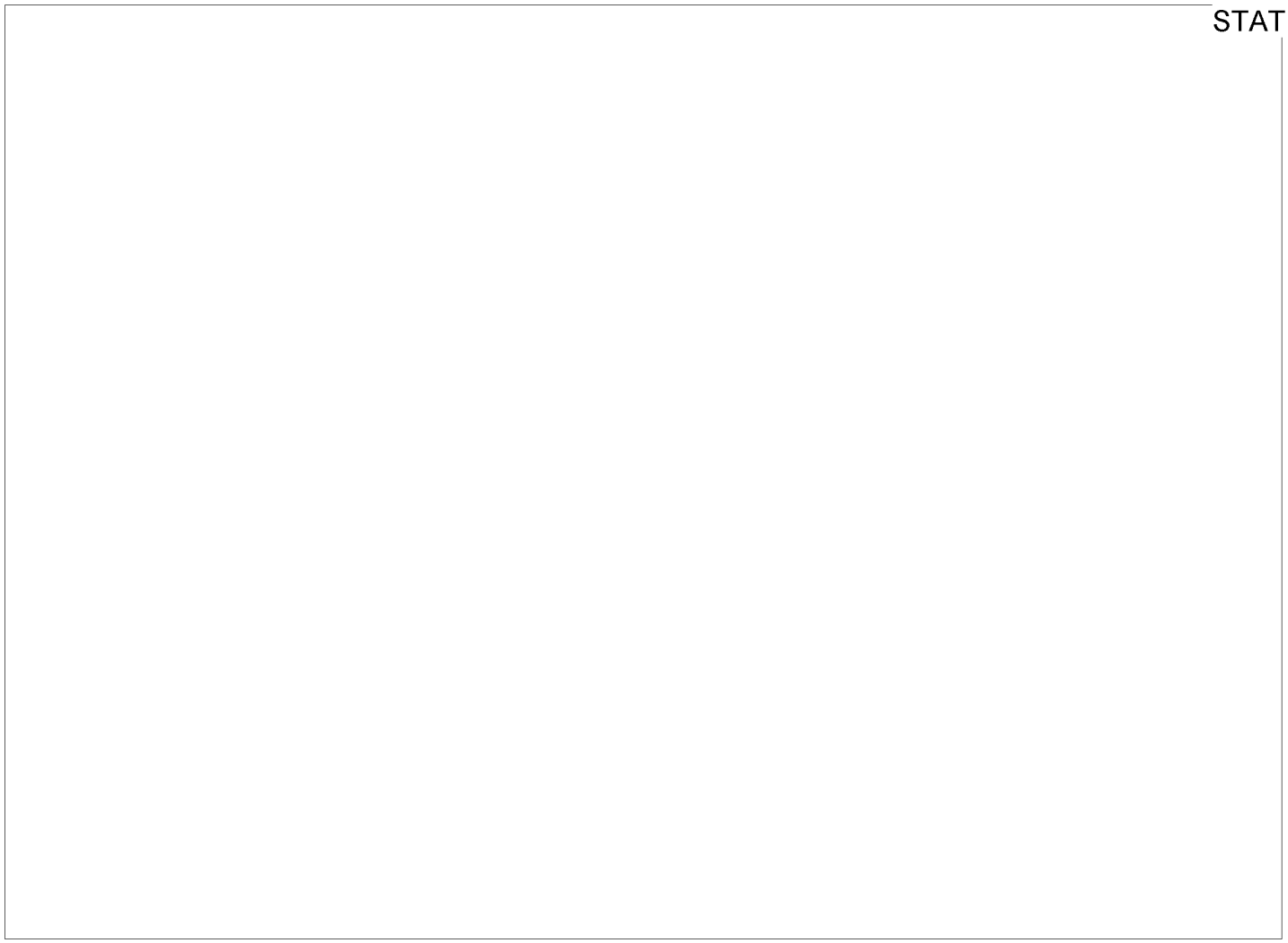

Figure 2.1-4. Membership of Advisory Councils -- Resumes of the Council Members are Included in Appendix B-2.

2.2 Corporate Support

Clearly defined responsibilities and reporting mechanisms between program and corporate management enable early problem detection and resolution.

CORPORATE AND PROGRAM RESPONSIBILITIES -- The fundamental objective of [redacted] D/C Segment organization is to satisfy the requirements of the NDPO. [redacted] NDS Program Manager is responsible for the execution of all activities within his organization to meet this objective. To achieve this objective, the corporation has six key responsibilities to the project:

a. Staffing the Program with Proper Management and Technical Skills. The [redacted] Team has assigned uniquely qualified individuals to the project and developed a comprehensive staffing plan, as discussed in Section 6.

b. Providing Facilities Space. Construction of NPIC facilities is in progress and will be completed in time to meet project schedules, as described in Section 2.3.

c. Providing Technical Expertise to Address Specific NDS Issues. Technical issues, such as the Communications Segment Local Area Network protocol, benefit greatly from using consultants with special expertise. [redacted] brought in key people from its Communications Products Division during the DCP to address communication protocols. This type of support will continue during SAP to address key issues.

d. Providing Executive Management Guidance to the Program. As NDS progresses, special internal reviews are conducted at key project milestones to independently evaluate project status and plans. These reviews also assure that the benefit from experience gained on other projects is applied to NDS. Within 90 days of contract award an independent team of key management and technical individuals will conduct a Program Control Review (PCR) to assess plans and status. The PCR report will be sent to [redacted] the [redacted] President and issues will be discussed directly with Project Manager [redacted] In addition, as discussed in Section 2.1, the Management and Technical Advisory Councils, which include key subcontractor management, meet periodically to assess status and issues.

e. Providing Staff Support to the Program. Within the division organizational structure are the finance, personnel, planning, and product quality assurance organizations. Each of these provide direct support to the program, and also provide [redacted] executive management with an independent perspective on program status. Each subcontractor has similar staff functions performing similar services.

f. Providing Investment Resources to Address Key Technical Issues. The [redacted] Team has made substantial investments to prepare ourselves for NDS. At [redacted] we spent approximately [redacted] in 1981 to develop NDS proposals. We invested [redacted] more to supplement the Study contract and we spent some [redacted] in discretionary IR&D covering a range of technical issues. Indicative of this work is our development of a Series/1-based pilot model of an integrated work station incorporating video disk technology, shown in Figure 2.2-1. As part of our ongoing, supporting R&D program we demonstrated the model and reviewed our plans for its use with NPIC personnel. For 1982, we have allocated another [redacted] for proposal development activity and have increased our IR&D-related funding to [redacted] In addition, the product divisions that will provide ADPE to NDS are providing [redacted] with another [redacted] for related business and technical studies.

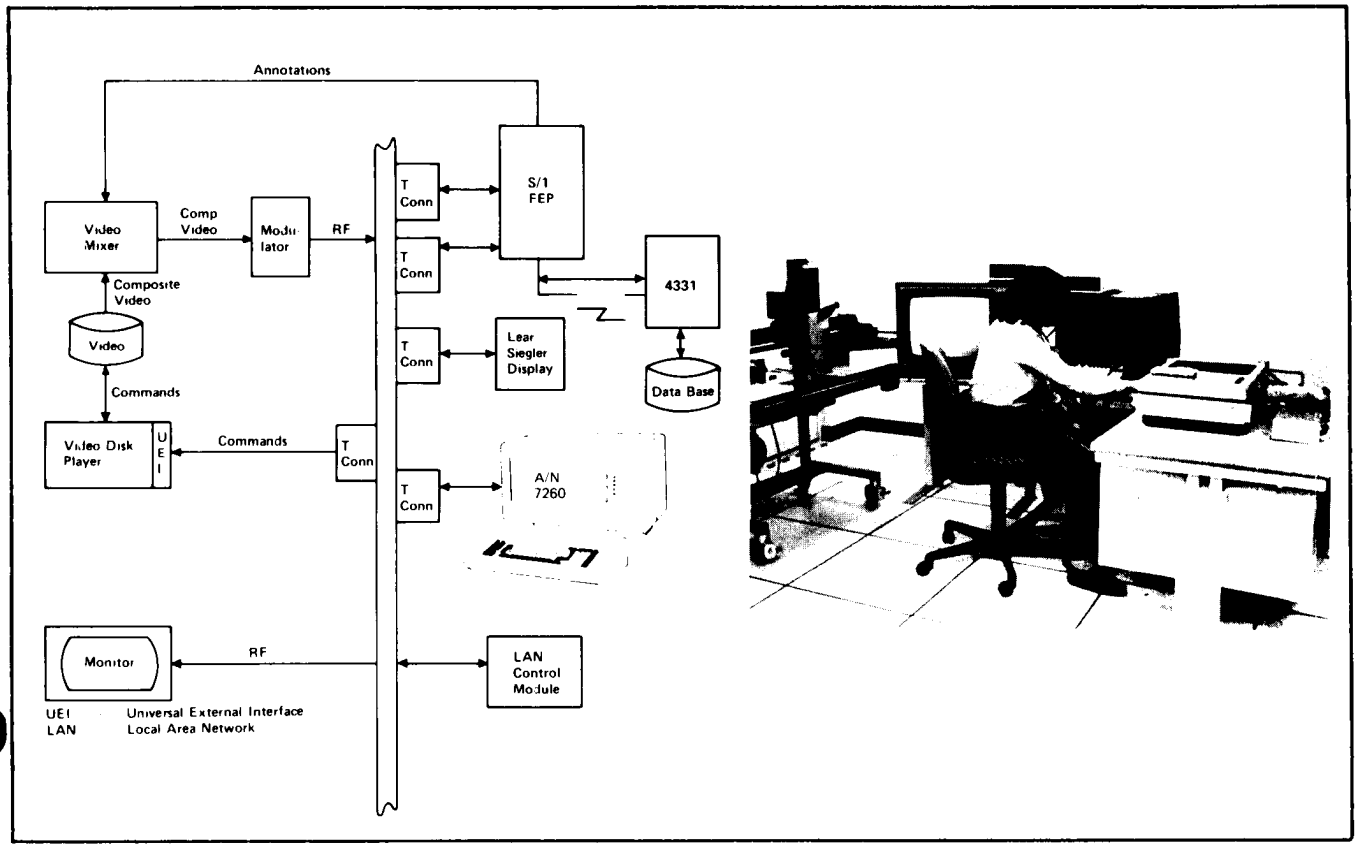

Figure 2.2-1. Work Station Investment Pilot Model -- Together With a Related Facility at [redacted] the Pilot Will be Used to Develop Techniques for Improving Productivity. STAT

[redacted] supplemented their Study and DCP phase activities with discretionary STAT
funds. In 1982, they allocated approximately [redacted] to D/C Segment-related R&D. They STAT
plan a similar level of investment for 1982. [redacted] has invested more than [redacted] in work STAT
station-related developments since 1979. They plan to invest an additional [redacted] in STAT
1982.

Our investment in facilities for NDS are discussed in Section 2.3. Together with our proposal and R&D investment, the team's total investment for 1981/1982 comes to more than [redacted] STAT

REPORTING METHODS AND REVIEWS -- The procedures used by the project team to develop plans, anticipate and identify problems, and to track progress are described in detail in Sections 3 and 4. It is the responsibility of the project management to provide corporate management with accurate status information, a clear identification of programmatic issues and plan for their resolution, and a specific request for any additional resource requirements.

This communication occurs in four distinct ways. First, on a continuous basis [redacted] STAT
[redacted] ivision Vice-President of Defense and Space Systems, and [redacted] discuss STAT
program status. All major issues are tracked with appropriate action plans and status.
Second, on a monthly basis [redacted] President, is briefed on plans, status, and STAT
any special needs. Third, at key program milestones, formal internal reviews such as the PCR described earlier and the meetings of the Technical and Management Advisory councils are held. Finally, on a semi-annual basis the NPIC project participates in a division-wide planning activity which focuses on changes in program requirements for investment resource funding, facilities and staffing.

Each subcontractor uses similar management reporting mechanisms. [redacted] has met with STAT
the key subcontractor executive managers who are members of the Management Advisory Committee and have their concurrence that any issues they are aware of will be
appropriately surfaced to [redacted] STAT

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2.3 Facilities

Construction of a new SCIF, specially designed for NDS, is currently underway and eliminates any risk of not having facilities available for contract performance.

Almost all of the D/C Segment development activities will be conducted in our [redacted] personnel will be colocated in [redacted] team. Located about 25 miles from downtown Washington, the facility is close to the main plants of our subcontractors, as shown in Figure 2.3-1. [redacted] the planned manufacturing site for the IWS is less than a 3-hour drive. Proximity to NDPO will facilitate communications and our responsiveness to customer direction. STAT STAT STAT

Figure 2.3-2 shows the floor plan of the new SCIF being built to Tempest standards. The shaded area, comprising 7500 square feet, will be used at project start, along with 5600 square feet of existing SCIFs that are now being used for NDS. The new area contains offices for 60 people, a reception and security control area and a 75 seat conference room with audio-visual facilities (Figure 2.3-3).

The complete SCIF will be ready for occupancy by November 1. It includes six conference rooms and the terminal and computer rooms for the Development and Test Laboratory (DTL). Figure 2.3-4 shows the layout of the DTL. It will contain three processors-[redacted] and the GFE Univac 1100/81--and associated IWS terminal and storage devices, together with powerful CADAM and SCRIPT facilities. The DTL also contains 90 alphanumeric terminals, for software development and program management. The Laboratory will also be operational by November 1, 1982. Until that time, the project will use an interim DTL in a secure area recently used for Project ZIRPEL. STAT

Because we anticipated the need for these additional facilities and began construction in January 1982, they will all be available when needed; they meet the project's needs and there is no risk in achieving schedule.

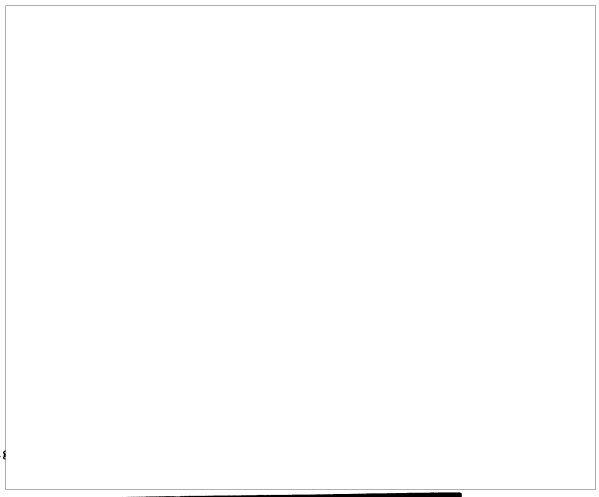

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Figure 2.3-3. Large Conference Room--We Recognize That Productive Meetings Require an Appropriate Environment. The SCIF Contains Six Conference Rooms. One Seats 75 People and is Similar to that Shown, in Another SCIF.

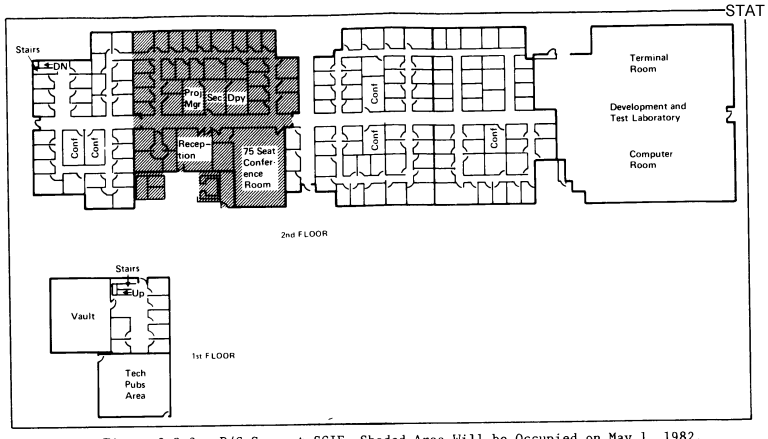

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Figure 2.3-2. D/C Segment SCIF--Shaded Area Will be Occupied on May 1, 1982. Balance on September 15 and November 1, 1982. Prior to September 15, the Project Will Occupy Additional Space in Existing SCIFs

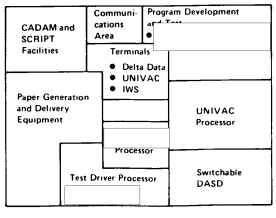

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Figure 2.3-4. Simplified Layout of the Development and Test Laboratory--Contained Within the SCIF: Three Mainframe Processors, and Communications and Operational Terminals. Also 90 Terminals for Software Development and Project Management Personnel and CADAM and SCRIPT Facilities

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PROJECT MANAGEMENT

Section 3

PROJECT MANAGEMENT

3.1 Organization

We have established a strong D/C Segment project management organization with clear lines of responsibility and staffed it with technical and management personnel who have the right experience and demonstrated ability to meet NDS program objectives.

ORGANIZATION IS STRUCTURED FOR EFFECTIVE DEVELOPMENT [redacted] organizational policy [redacted]STAT major programs is to establish a self contained program organization with total performance responsibility and effective control over the resources needed to get the job done. Our experience on major DoD and NASA development and integration programs such as LAMPS and DSM indicate this approach best assures the dedication and direction essential to program success.

NDS is one of six current [redacted] programs of such high national importance that the pr[redacted]STAT ject manager warrants reporting directly to an [redacted] Vice President. [redacted] D[redacted]STAT Segment Project Manager, reports directly to [redacted] Vice President, Defense [redacted]STAT Space Systems, to assure high executive visibility within [redacted] STAT

The D/C Segment project organization (Figure 3.1-1) is structured around the primary performance tasks defined in the WBS and SOW. By grouping related functions under single leadership we simplify lower level interfaces and ensure well-defined assignment of responsibility. The structure is an effective one for a major development effort in that it permits orderly phasing of activity through the natural evolution of design, development, test, and integration. System specifications are prepared by the System Engineering department; product development is accomplished by the Segment Development department in accordance with the system specifications; integration and segment tests are performed by the Integration Test and Transition department in accordance with test plans and procedures. This structure allows initial development of the next system release (e.g., IOC) to begin during the integration and test of the previous release (e.g., BOC) allowing a controlled overlapping of activities to shorten schedule without introducing risk.

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OUR ORGANIZATION WILL BE REALIGNED TO FULLY SUPPORT OPERATIONS--After the IOC Factory Acceptance Test, full scale development activity will have been completed, and site [redacted] activities become the dominating emphasis. At that time we will realiSTAT to a streamlined organization to address site testing and transition to operational status (see Figure 3.1-3). Key technical and management personnel will be retained throughout the FY88 O&M period to ensure continuity of knowledge and expertise.

The Operations and Maintenance department will be located at [redacted] to support STAT testing, to train and assist personnel in operational use and to troubleshoot and to diagnose D/C Segment problems. The department will be staffed with key people having system, software and hardware expertise to respond promptly to operational needs.

The Engineering Support department, located at the development facility, will be available to support site personnel should additional resources or expertise be required. They will also be responsible for ECP activity.

The Project Control Office will retain its cost, schedule, data management and configuration management responsibilities. It will assume the additional responsibilities of synchronizing activities between site and development facilities and management of our subcontractors.

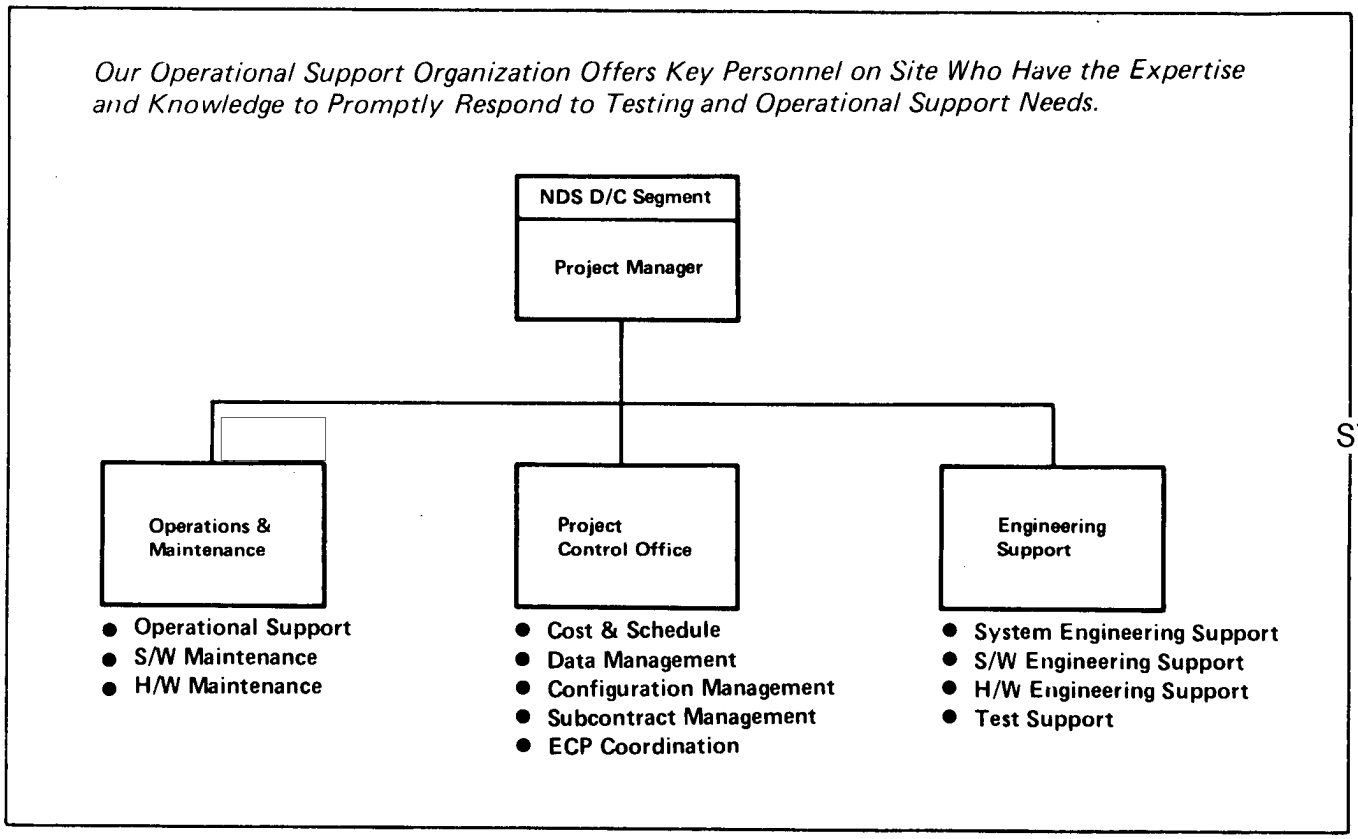

Figure 3.1-3. Operational Support Organization

3.1.1 Subcontractor Organization

The [redacted] subcontractors have each established dedicated NDS Project Organizations which will be located in the [redacted] facility. STAT STAT

[redacted] has selected [redacted] to perform on the D/C Segment development. Their respective organizations are shown in Figures 3.1.1-1 through 3.1.1-3. Each of the subcontractor Project Managers - [redacted] STAT STAT STAT
[redacted] - has been delegated by their senior management with full authority to direct all assigned resources and to represent and commit their respective companies on all matters pertaining to the D/C Segment. Contract performance will be at the [redacted] to facilitate communications and to permit quick problem identification and resolution. STAT

Each subcontractors qualifications and primary role are highlighted below. Section 3.3, Subcontractor Management, describes their responsibilities and Statements of Work.

a. [redacted] selected [redacted] for STAT their unique and in-depth knowledge and experience with NDS operations including mission support data processing functions, segment test, user operations in data entry and reporting, and cable generation. They are thoroughly familiar with the intelligence problems and tasking concepts, collection strategies, collection management and accomplishment reporting. We have capitalized on their experience by assigning them tasks in operations concept analysis, transition planning, training, test, and selected software development.

[redacted] STAT

b. [redacted] was selected for their extensive experience with the Intelligence Community, which includes classified programs with the Intelligence Community Staff, the Defense Intelligence Agency and other Government agencies. Based upon this experience, [redacted] will primarily support [redacted] on software development relating to Pre-Exploitation and simulation for design validation.

c. [redacted] was selected for their knowled STAT and experience in Integrated Work Stations (IWS). [redacted] is now under contra STAT to Navy Intelligence and the Army providing large scale IWS's. These IWS's, per- forming complex imagery analysis tasks and comprehensive alphanumeric fun STAT tions, are very similar to the requirements of the NDS program. [redacted] will STAT support [redacted] in the IWS hardware development and the associated IWS softwar STAT development.

[redacted] STAT STAT

3.1.2 Organizational Responsibilities

Each organization has technical and financial responsibility for specific tasks with clear traceability to the WBS and SOW.

OUR PRACTICE IS TO ASSIGN A SINGLE POINT OF RESPONSIBILITY--A cornerstone [redacted] management philosophy is single-point accountability. This concept demands that each individual in the organization is assigned a specific area of work for which he is totally responsible and accountable. Managers are given responsibility for specific, clearly defined areas within the project. They are responsible for achieving a thorough understanding of requirements, monitoring the status of development items, monitoring and coordinating delivery schedules and managing their departments to deliver quality products. STAT

Each manager in the D/C Segment organization is assigned responsibility for specific contract deliverables, WBS elements and SOW tasks. These managers are responsible for planning these tasks, subdividing, and delegating them to lower levels, coordinating external and internal dependencies, monitoring status, and delivering quality products.

OUR WBS MAPS DIRECTLY TO OUR SOW--The work effort has been partitioned in a logical fashion, permitting the members of our team to simplify interfaces, crisply define accountability and permit objective measurement of performance. [redacted] SOW has been written to correspond to the Government WBS and our WBS is directly traceable to the SOW. The project organization has been structured around the primary performance tasks defined in the WBS and SOW. Figure 3.1.2-1 shows the SOW to WBS correlation and the responsible [redacted] manager. STAT STAT

The SOW's for our three subcontractors have also been written to correspond to the WBS (Reference Appendix B-1). Section 3.3 describes in detail the subcontractors responsibilities and the role of the Subcontract Acquisition Manager.

The Project Control Office identifies the data element required to satisy the contract needs, schedules the data deliveries and verifies the accuracy of the form and format of such data. The originating department maintains the responsibility for the technical content and the need for any revision activity. The PCO coordinates the final document review before it is delivered, ensuring Quality Assurance and other technical organization review prior to approval for delivery. The PCO, working with Security, is the only authorized [redacted] office to issue, reproduce and make distribution of formal documents, schedules and subsequent revisions. STAT

3.2 Project Management

The NDS Project Manager [redacted] *single point of responsibility for accomplishing the D/C segment objectives and he has the complete resource control authority.* STAT

OUR PROJECT MANAGER HAS FULL AUTHORITY - [redacted] is directly responsible for contract performance and project success. He is authorized by [redacted] to represent [redacted] to NDPO and to commit the Company on all technical and contractual matters. STAT STAT STAT

In managing cost, schedule, and technical performance the Project Manager:

a. has the sole authority to commit program funds. He allocates budgets to his subordinate managers by authorizing work packages and he tracks their progress using [redacted] Program Control Management System (PCMS). He alone has the authority to terminate work packages and to add new ones. STAT
b. is authorized to establish internal schedules consistent with the contractual schedule and to accept schedule redirection from cognizant Government authority.
c. has the authority to reorganize and redeploy his resources to meet unforseen performance or schedule problems and to obtain additional specialized resources if needed. By virtue of his reporting position and [redacted] specific charter, he has priority in calling on our most experienced people. If needed, he can engage other subcontractors or consultants. STAT
d. has established formalized interdepartment communications procedures and regular internal reviews to ensure that all technical work, as described in the Project Master Control Plan, is accomplished and meets NDS requirements. He has approval authority for all contract deliverables.
e. influences the Division's allocation of discretionary funds. He has presented and gained approval for a 1982 program estimated at [redacted] with direct cost and schedule risk-reduction benefit for NDS. STAT

MANAGEMENT BY OBJECTIVES IS A PROVEN MOTIVATOR -- [redacted] reputation as one of the strongest management teams in industry stems from a rich base of complex systems management experience and a set of beliefs on which we premise all of our polices and actions (see Figure 3.2-1). For over 25 years [redacted] has evolved a mature set of policies and procedures which integrates technical directives, project management, and people management. STAT STAT

To encourage employees to perform at the peak of their capability, [redacted] utilizes a performance planning and evaluation program. Performance objectives reflect specific NDS work responsibilities that are assigned to each individual. The degree to which these objectives is met is the principal determinant in salary reviews and promotion. When our team does well in a contractual evaluation, our key people do well in their own appraisals. Our performance planning and evaluation process has been defined over years of use, and has proven to be an effective way to motivate and reward people. STAT

Excellence, Customer Service, and Respect for the Individual are the Basic Beliefs On Which Our Policies and Actions Rest.

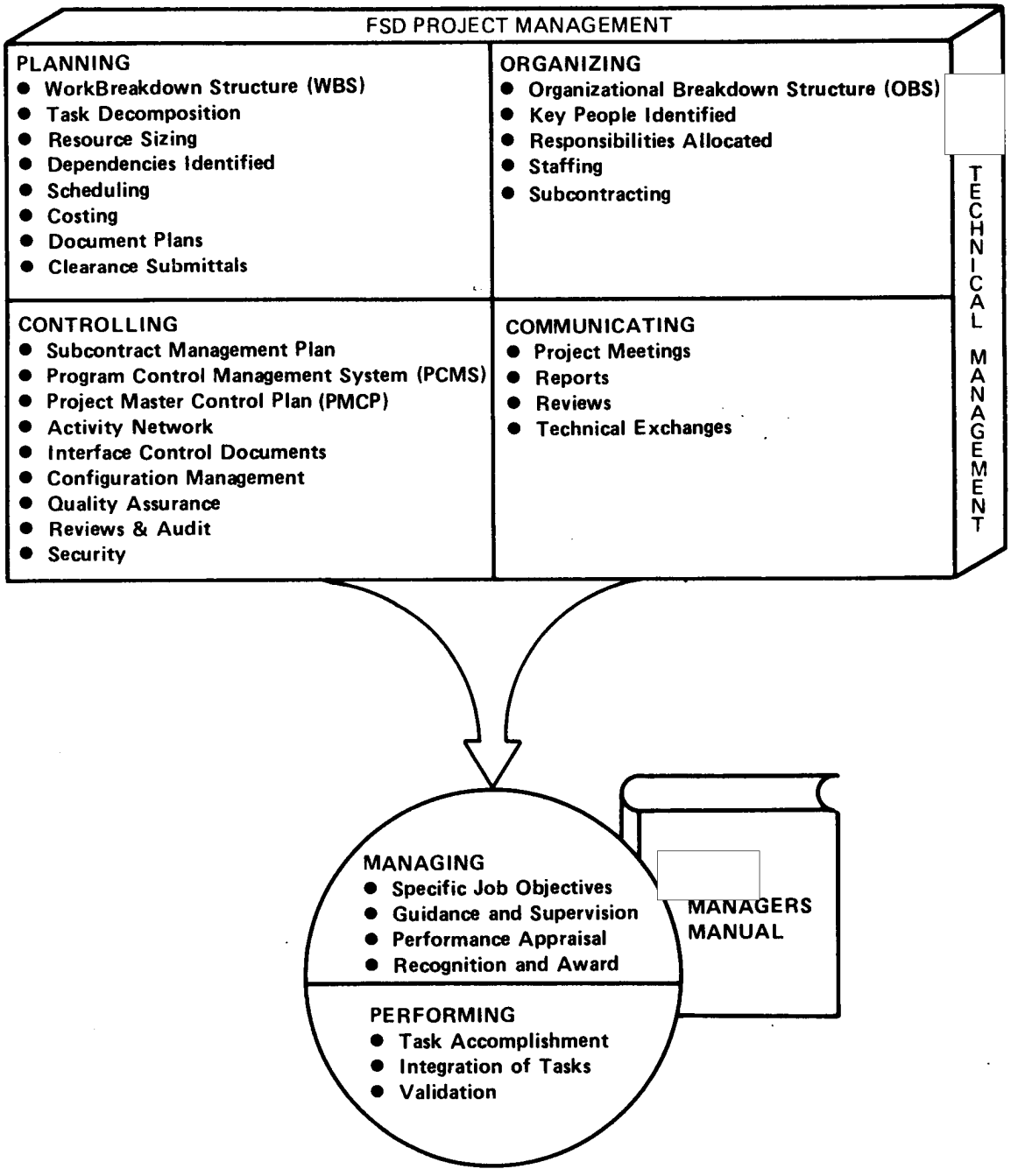

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Figure 3.2-1. Integrated Management

3.2.1 Project Management Plan Overview

[redacted] will use an integrated technical, cost, and schedule management approach to achieve successful BOC, IOC, and FOC deliveries. STAT

[redacted] experience in developing complex systems such as Apollo, LAMPS, GPS, and DSM has produced a mature set of practices and procedures for managing the development of large systems. These procedures, covering project management and technical management, have been tailored according to customer requirements for the D/C segment and reflected in this proposal. This process will continue into the SAP to insure our experience, as reflected in these management procedures, is best applied to the important BOC, IOC, and FOC objectives. STAT

PROJECT PLANS--Figure 3.2.1-1 reflects [redacted] overall management approach. A set of management and technical plans are written to describe the overall approach which will be used on the project in various areas. In general these plans are written only once, although they may be updated occasionally to reflect changes in overall approach. STAT

[redacted] basic approach to Project Management is formally documented and has been designed for firm control and high visibility both internally to [redacted] and externally to our customer. Using the Program Implementation Directive (PID) and the D/C Segment RFP and supporting appendices, we have adapted our procedures in accordance to your guides in establishing our D/C SAP approach and plans. Our approach imposes controls at the very beginning of an effort through to its completion. The concept of baselined plans and reporting status is an integral part of our approach. STAT STAT

The Segment Development Plan and subordinate plans, Subcontractor Management Plan, Configuration Management Plan, and Quality Assurance Plans provide the early guidance on how we will manage and control the development effort.

Prior to contract award we will have all of our development plans in place. These will be updated at contract award time to reflect changes resulting from reviews, negotiations, or redirection.

PROJECT CONTROL DOCUMENTS--The primary working documents used to track, monitor, and control project status are the Project Master Control Plan (PMCP) and the Program Control Management System (PCMS).

The PMCP is used by the management team to assign work responsibility to specific organizations and people, and to review status of activities. The PMCP contains a detailed list of all project activities, including who is responsible for the activity and what the due date is for completion. It also contains a detailed list of project issues which require the focus of both [redacted] and Government management. This document is updated weekly and used as the basis of review meetings by the project manager with internal [redacted] and subcontractor management as well as Government management. The PMCP is described in detail in Section 4.2.2. STAT STAT

The PCMS system is used to project, monitor, and track cost estimates against actual expenditures. This system was first certified as meeting the requirements of DODI 7000.2 in 1972 and that certification was extended in 1975. It is a comprehensive system which covers planning, tracking, and corrective action and incorporates the earned value concept in evaluating both schedule and cost status. Actual cost and

schedule status is reported against the baselined planned position. Monthly, each performing manager reviews his progress relative to the established milestone and assesses his earned value. Because multiple measurable milestones have been carefully defined, an objective measure of progress is determined. A detailed description of how this system works is presented in Section 4.2.1.

The third major control mechanism is the use of formal reviews throughout the development and implementation process. Customer reviews, such as PDR, and CDR provide methods to baseline the overall system requirements and design, and provide Government insight into system status. In addition, there are detailed internal reviews of system design. As software and hardware are developed, in-depth design and code inspections are held. These plans and processes are discussed more fully in Section 5.

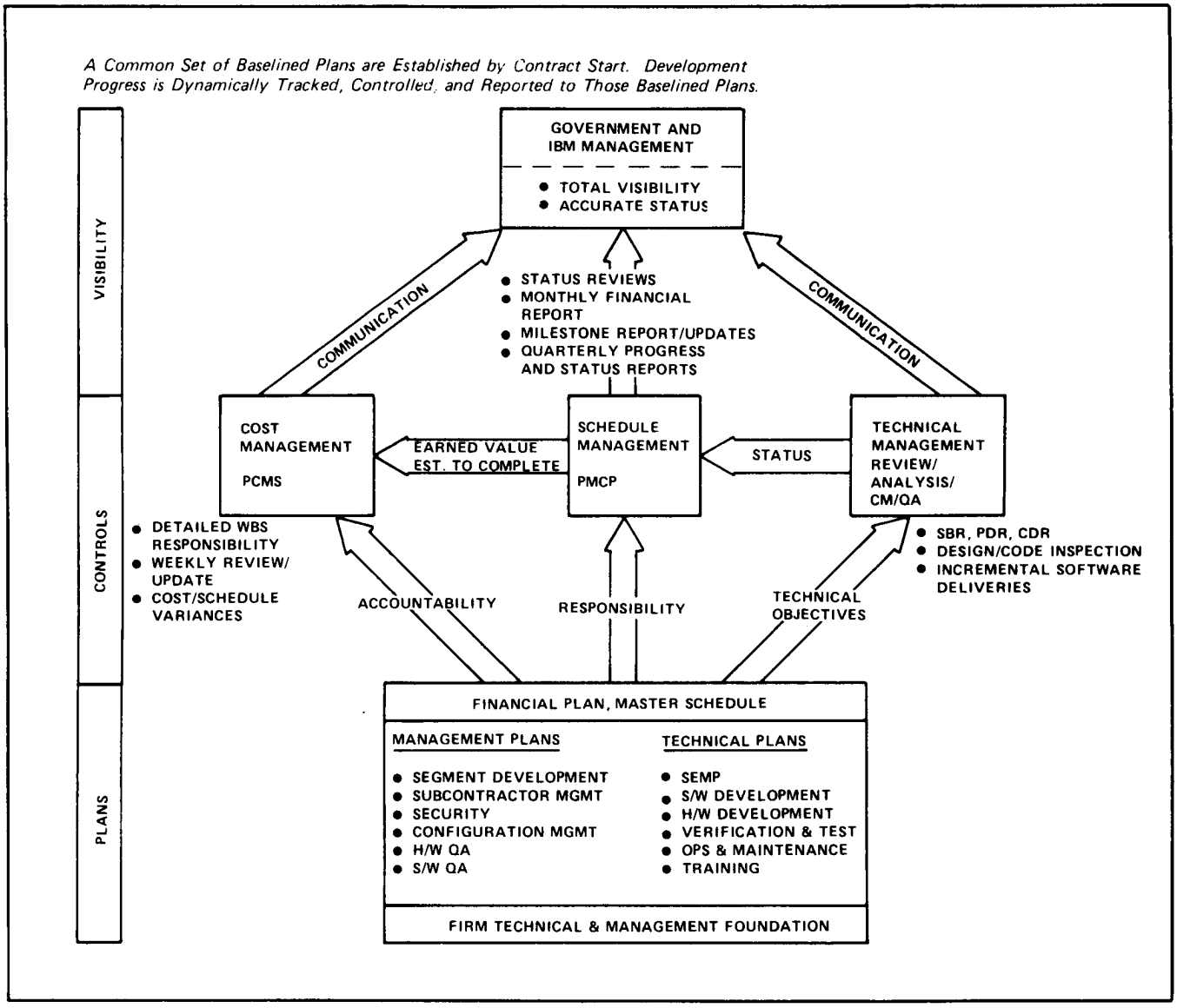

Figure 3.2.1-1. Project Plans, Control, and Visibility

3.2.2 Government Visibility

Our project management plans and procedures provide high visibility into the development process.

There are four levels of interaction with the Government which will ensure early identification and quick resolution of problems while maintaining good control over development baselines.

CONTRACTUAL INTERFACE-- All deliverables fall into this category. The Project Control Office Manager is responsible for coordinating the final review and delivery of CDRLs and ensuring that QA inspects them against our quality standards.

TECHNICAL REVIEWS AND INTERFACE MEETINGS -- This category includes formal customer reviews, such as PDR, CDR etc, to establish development baselines and Interface Control Working Group Meetings to generate ICDs. The System Engineering Manager is responsible for the reviews and our support of Interface Control Working Groups (ICWG).

We propose a Segment Baseline Review (SBR) within 60 days of contract award to reach agreement of segment requirements particularly for those requirements affecting BOC. This milestone will enable our segment design activity to get an early start and will facilitate the subsequent PDR to focus on preliminary design. We realize that open issues on selected requirements will exist and changes will be imposed as the other segments are reviewed. However, the SBR will provide us with an important level of understanding and guidance to initiate the design activity in the proper direction.

PROJECT STATUS REVIEWS AND REPORTS -- The Project Manager will conduct the monthly status reviews and submit the Quarterly Progress Report to provide status to the customer on a regular basis.

[ ] has assigned the Project Control Office (PCO) as the primary organization for collecting and maintaining the program status. The PCO will maintain a central data bank to facilitate our interfaces. The NDPO, through a single contract to the PCO, can acquire the latest versions of all CDRLs and other NDS correspondence. STAT

TECHNICAL EXCHANGES AND DAY-TO-DAY INTERFACES -- [ ] will identify and make available the right personnel to respond to Government questions. We expect and encourage points of contact to be established so that technical counterparts can participate directly. To achieve open yet disciplined dialogue, significant interchanges will be documented to highlight issues discussed and agreed upon follow-on activity. Critical issues and important discrepancies uncovered in our discussions will be brought to the attention of the NDPO immediately by the Project Manager. As discrepancies are uncovered, we will apply strong management direction to resolve them at the working level, identifying and applying the most effective corrective action. Our team's 30 minute proximity to NDPO will facilitate the effectiveness of this communication. STAT

3.3 Subcontractor Management

Our Subcontract Acquisition Manager has successfully negotiated a detailed Statement of Work, set of deliverables, and performance schedules with each of our subcontractors.

SCOPES OF WORK AND AN AWARD FEE STRUCTURE HAVE BEEN AGREED TO--We have received signed off proposals from each subcontractor in which they responded to detailed Statements of Work. [redacted] is responsible for operations concept analysis, transition planning STAT integration, test, training and selected S/W development. [redacted] has responsibilities STAT for the IWS and associated software. [redacted] is developing a simulation model for des STAT validation and the Pre-Exploitation CPCI. Responsibilities for deliverable items are explicitly defined in Figure 3.3-1.

The subcontractors agreed to sign a Cost-Plus-Award-Fee (CPAF) contract with a small cost base and the remaining fee based on award. The award will be based on three performance measurements: technical management, milestone management and cost control. Evaluation of subcontractor performance will be accomplished by a Performance Evaluation Board (PEB) consisting of the [redacted] subcontract Acquisition Manager, STAT the member of his staff assigned to that particular subcontract and managers of Systems Engineering, Hardware Development, Software Development, Integration Test and Transition, Procurement, and Quality Assurance. This board will numerically evaluate subcontractor performance every four months determining the fee earned for the period. Fee not earned for particular periods will be returned to a fee pool for possible use as added incentive against any critical tasks that arise throughout the project. This kind of award arrangement assures maximum performance from the subcontractors. The PEB will be chaired by [redacted] NDS Project Manager. This will assure fairness t STAT the subcontractors and continued high visibility into subcontractor activities.

FULL CONTRACTUAL RESPONSIBILITY IS ASSIGNED TO THE SUBCONTRACT ACQUISITION MANAGER -- [redacted] subcontract management approach places cost, schedule and technical control STAT our three subcontractors with our Subcontract Acquisition Manager, [redacted] w STAT reports directly to the Project Manager. He has exclusive authority to direct contract changes (through Procurement) and to direct each subcontractor's Project Manager. He is accountable for results. He is responsible for monitoring the subcontractors' total cost, schedule and technical performance and for ensuring that technical exchanges occur with appropriate [redacted] groups. For each of the subcontractors, STAT [redacted] has assigned a strong senior-level technical individual who is responsi STAT for monitoring the technical performance of that subcontractor and for calling on [redacted] STAT groups to critique and provide technical guidance to subcontractors. Direct technical interchange occurs as needed between the subcontractors and the appropriate [redacted] te STAT nical group (see Figure 3.3-2). This organizational approach has been used successfully in managing over $3 billion in subcontracts on programs such as the B52 Avionics, LAMPS MARK III, TRIDENT, DSM and GPS.

SUBCONTRACTORS ADHERE TO [redacted] PROVEN CONTROLS- [redacted] systematic management is imp STAT on our subcontractors and is reflected in our NDS Subcontract Management Plan. We have imposed DODI 7000.10 financial reporting, our Quality Assurance Controls, our Configuration Management procedures, and our planning and reporting procedures. Section 4 describes in detail our project plans and control methodology.

Subcontractor SOWs Clearly Delineate Measurable Tasks and End Products.

SUBCONTRACTOR	ACTIVITY	CDRL #	CDRL NAME
	System Engineering	116	Segment Operations Concept
		133	Segment Operations Spec
		135	Users Manual
		136	Operators Manual
		141	BMANIP Part 1 Spec
		141	BTTDEV Part 1 Spec
	Software Development	138	BMANIP Programmers Manual
		138	BTTDEV Programmers Manual
		142	BMANIP Part 2 Spec
		142	BTTDEV Part 2 Spec
		145	BMANIP Data Dictionary
		145	BTTDEV Data Dictionary
		150	BMANIP CPCI
		150	BTTDEV CPCI
	Test & Verification	131	Test Plans
		154	Segment Test Report
	Installation-Checkout & Test	115	Segment Transition & Integration Plan
		134	Segment Installation Plan
		139	Facility I.D.R.S
		147	Segment Shipping Plan
	Maintenance (UNIVAC System)	N/A	UNIVAC System/Software Support
	Training	140	Segment Training Plan
		146	Segment Training Materials
		N/A	User Training
		N/A	Operator Training
		N/A	Maintenance Training
	Operations & Maintenance (BMANIP, BTTDEV)	123	Operations & Maintenance Plan
		124	Maintenance & Logistics Plan
		N/A	Problem Trouble Reports
		N/A	CCB Assessments
	System Engineering	119	Requirements Traceability & Verification Matrix
		141	BEPPRE Part 1 Spec
		155	Technical Performance Measurements
		N/A	Design Validation Report
	Software Development	138	BEPPRE Programmers Manual
		142	BEPPRE Part 2 Spec
		145	BEPPRE Data Dictionary
		150	BEPPRE CPCI
	Operations & Maintenance (BEPPRE)	N/A	Problem Trouble Reports
		N/A	CCB Assessments
	System Engineer	141	WAPPLS Part 1 Spec
		141	WSYSTEM Part 1 Spec
	IWS Hardware Development	(CI)	360 Basic Work Station
		(CI)	140 Expanded Work Stations
		(CI)	500 Image Work Stations
	IWS Hardware Sparing	N/A	Hardware Sparing Plan
	Software Development	138	WAPPLS Programmers Manual
		138	WSYSTEM Programmers Manual
		142	WAPPLS Part 2 Spec
		142	WSYSTEM Part 2 Spec
		145	WAPPLS Data Dictionary
		145	WSYSTEM Data Dictionary
		150	WAPPLS CPCI
		150	WSYSTEM CPCI
	Operations & Maintenance (WAPPLS, WSYSTEM, IWS)	131	IWS Test Plans
		131	Tempest Test Plans
		N/A	IWS Test Procedures
		N/A	Tempest Test Procedures
		N/A	Problem Trouble Reports
		N/A	CCS Assessments

Figure 3.3-1. Subcontractor's Responsibilities

Each subcontractor will submit detailed plans and schedules for inclusion in the Project Master Control Plan. They will assess their status and review their Project Master Control Plan updates with the Subcontract Acquisition Manager at least weekly. The plans, interfaces, and status for the all D/C Segment Contract Performance are reviewed at the weekly PMCP review meeting.

We will emphasize early problem identification with our subcontractors by close monitoring and frequent communication. In addition to the formal fourth month performance evaluations, interim critiques will be reviewed with each subcontractor.

HIGH GOVERNMENT VISIBILITY INTO SUBCONTRACT EFFORTS IS PROVIDED -- Subcontractors will participate directly in formal reviews to the customer such as PDR's, CDR's and test reviews. At monthly customer status reviews, [redacted] will report on the progress STAT the subcontractors and when appropriate the subcontractors themselves will provide detailed status to the customer. In addition, our subcontracts will be awarded and administered in accordance with DCAS approved [redacted] Procurement policies and procedurSTAT These provisions allow the Government or his representative to review progress in our location and witness key tests as required. Our subcontractors are colocated with us in our [redacted] facility and the total team is in close proximity to govern-STAT ment personnel. This colocation will promote an integrated team approach through weekly technical exchange meetings as well as frequent informal discussions among all our team members.

Disciplined Checks and Balances Allow a High Level of Interaction to Ensure Technical Continuity.

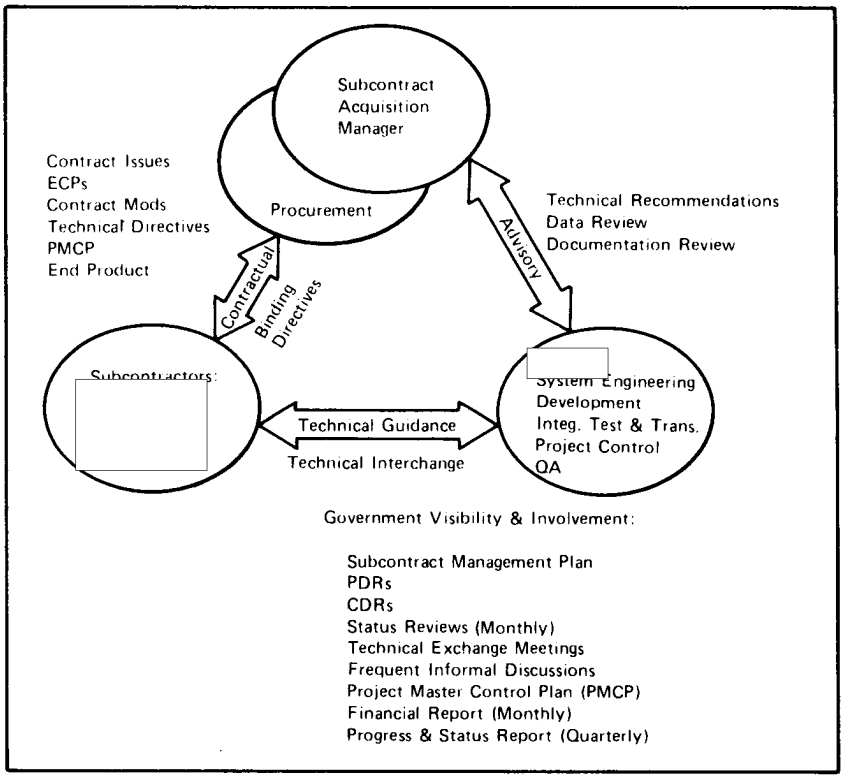

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Figure 3.3-2. [redacted] Team Interactions STAT

3.4 Security

[redacted] *security plan, used successfully on Agency programs, and over 30 SCI projects, fully complies with the high security directives of NDPO.* STAT

PROVEN EXPERIENCE WITH AGENCY SECURITY REQUIREMENTS -- [redacted] security organization has successfully supported our current and past technical activities on major Agency programs including Applications Development, CAMS, DORIC, Intelligence Community Staff Studies, and other classified compartmented activities. Our security staff also supports activities with other Government agencies on many SCI projects such as ZIRPEL, MINSTREL, and Sea Nymph. Our security policies, procedures, and SCI facilities have been proven by successful performance to be in compliance with the NDS Security Guide and the "Standard Security Procedures for Contractors" manual. STAT

OUR SECURITY ORGANIZATION IS RESPONSIBLE TO EXECUTIVE MANAGEMENT -- To make certain that the desired high level of security is maintained, all SCI security functions are responsible directly to [redacted] executive management. Our NDS D/C Segment security organization is structured to provide responsible and effective security support and guidance to D/C Segment personnel. The organizational chart is shown in Figure 3.4-1. STAT

[redacted] is the NDS D/C Segment Project Special Security Officer. He has over 15 years experience with SCI activities at the Agency. His responsibilities and duties will be to administer the security program, including coordinating subcontractor security activities, and directing those functions outlined in Figure 3.4-1. He will be the direct interface with NDPO on all security matters. The NDS D/C Segment security staff including alternate Project Security Officer, Security Specialists, and Document Custodians, report directly to him. STAT

Our Experienced Security Staff Has Clear Lines of Responsibility to the NDS Project Manager and to IBM Executive Management to Ensure Full Compliance to NDS Security Requirements.

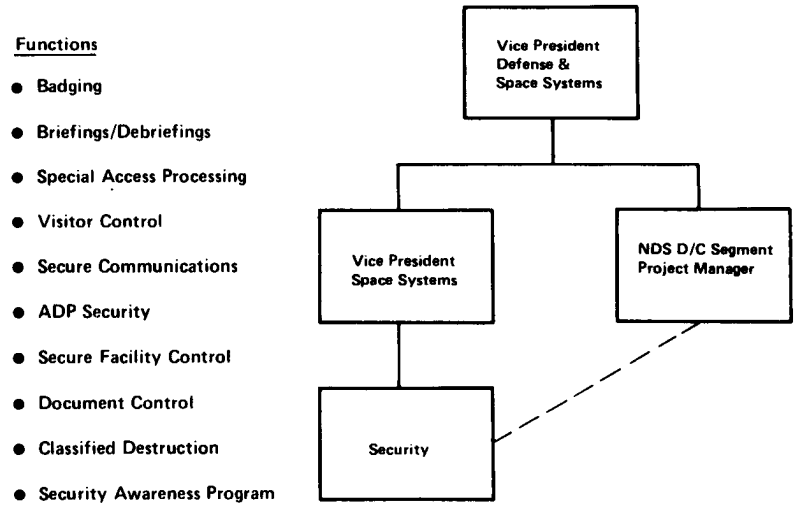

Figure 3.4-1. Security Organization and Functions

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3.4.1 Security Procedures

Our Security Plan and Procedures for the D/C Segment are an extension of DCP Security and will include the additional requirements and procedural changes to fully satisly all NDS SAP security guides.

STANDARD PRACTICE PROCEDURES (SPP) ARE BEING EXPANDED -- All security plans and procedures meeting Agency requirements during the Study and Design Competition Phases have been reviewed. These proven procedures are being expanded to include new secure facilities, additional access controls, upgraded document control procedures, additional ADP, and other procedural changes. The Security Plan and SPP will be in place by contract award.

As shown in Figure 3.4.1-1 the SPP will address the primary areas of personnel, subcontract interfaces, document control, physical security, access control and ADP security as well as other areas of security interest. All NDS D/C Segment project personnel, including our subcontractors on premise, will be required to read and acknowledge their understanding of SPP on an annual basis. The primary areas of the SPP are highlighted below and in the following section.

a. PERSONNEL SECURITY -- Based upon our activities in previous NDS phases, and with other groups in the Agency, [redacted] has considerable experience in processing requests for security accesses. Subcontractor requests for access will be submitted, with the approval of the [redacted] NDS D/C Segment Project Manager, by our security staff. STAT STAT

   Upon notification that an individual has been approved for access, the security officer will provide formal indoctrination and brief the individual regarding his security responsibilities. Additionally, in conjunction with our security education program, D/C Segment personnel will receive periodic reindoctrinations regarding project security and other SCI security awareness information.

   Procedures have been developed to ensure any security violations, or possible compromises, are promptly brought to the attention of the security officer. Any instances will be thoroughly investigated, and in accordance with instructions will be reported immediately to the Government.

b. SUBCONTRACTOR INTERFACES -- All on-premise subcontractors will adhere to our SPP in its entirety. Specific procedures addressing the interfacing with subcontractors have been established and are included in the SPP. These procedures distinguish prime and subcontractor responsibilities and the specific provisions for visit certifications, couriers, and communications. We will continue to exercise security cognizance to assure subcontractor compliance with NDS security guidelines and directives.

c. DOCUMENT CONTROL -- Agency document control guidelines utilized on DCP and past projects, formed the basis of our document control system for SAP. The system is separate from other document control systems and handles only NDS project related classified material within the secure area. Transmission of classified material will be coordinated with the Government and our subcontractors through established approved courier channels. Identification,

classification, and packaging will follow Agency guidelines. Reproduction of classified material will be by Government authorization and material will be controlled and accounted for by the document custodian. Destruction of classified material will be in accordance with authorizations. [redacted] ha STAT a Security Engineering Machine Model 22 approved by the Agency for SCI use. Procedures are in place that include two briefed individuals being present for the destruction process. [redacted] has an approved secure STAT communications facility in use and also utilizes special mailing addresses when required by SCI activities.

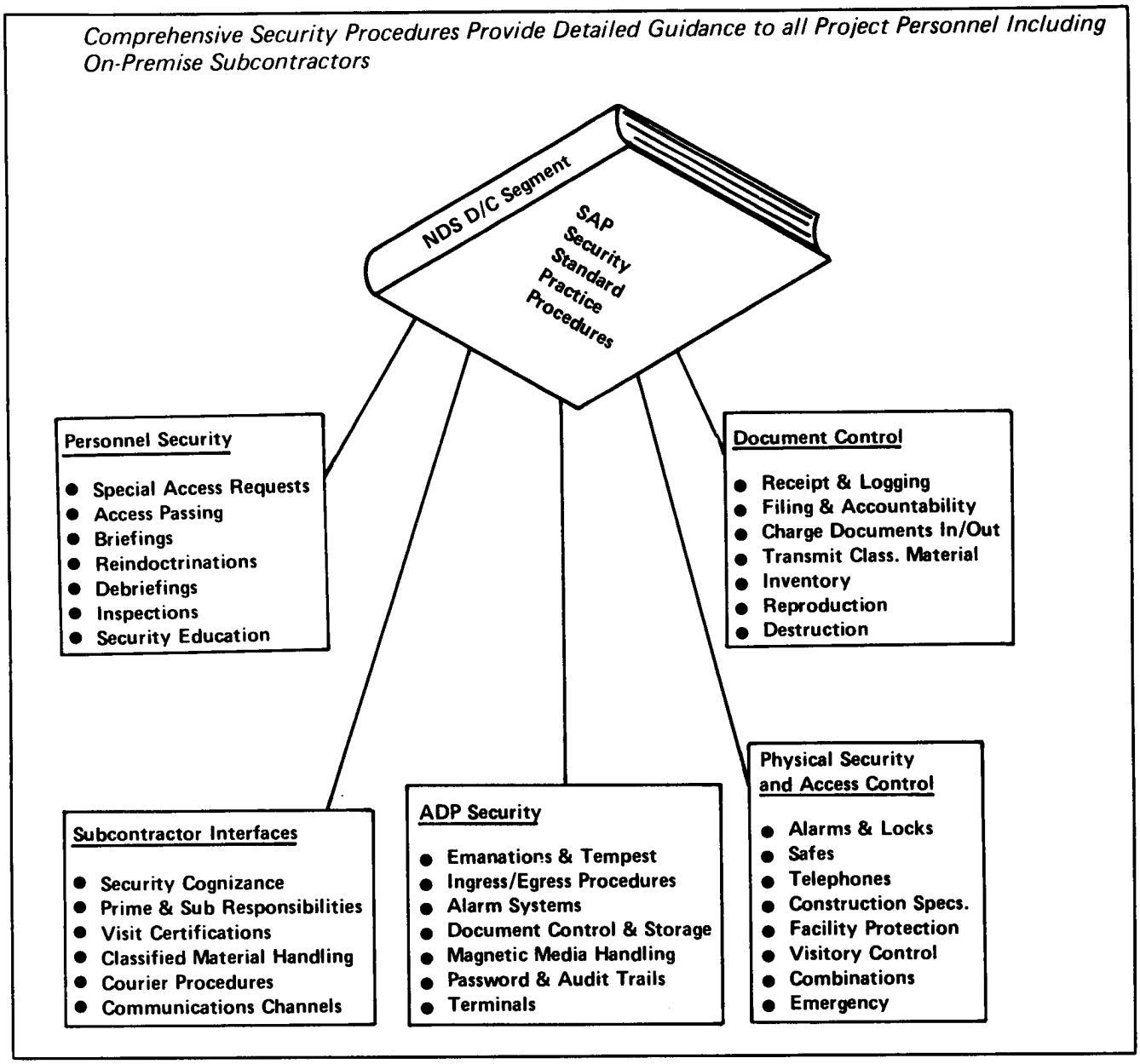

Figure 3.4.1-1. Security Standard Practice Procedures

3.4.2 Secure Facilities

We are expanding our secure facilities for the D/C Segment to a total of 40,000 feet maintaining full compliance to physical and security requirements.

PHYSICAL AND ADP SECURITY CONTINUE TO RECEIVE FULL ATTENTION--The physical specifications of [redacted] current and planned SCI facilities meet the requirements of the Agency. Our cleared facilities in [redacted] include secure work and storage areas as well as secure shielded computer facilities. In 1981, our expansion program included the addition of approximately 40,000 sq. ft. in secure facilities. Expanded new secure facilities are in progress for the D/C Segment SAP. The NDS D/C Segment security officer and his staff are working closely with our facilities organization to ensure all physical security standards and requirements are maintained. Floor layouts and additional facility data are shown in Section 2.3. STAT STAT

Storage for classified material is being provided to meet your requirements. We utilize both vaults and closed storage. The vaults are constructed and alarmed in accordance with Government specifications. For closed storage, GSA approved containers are used within a volumetrically alarmed secure area. Combinations are changed at six month intervals or more frequently as required. Appropriate logs and records are maintained for openings and closings. Currently, NDS D/C Segment has an operational interim computer facility in [redacted] In addition, [redacted] has three other RF shielded enclosures supporting SCI activities which fully meet NSA Specification 65-6. The SPP includes but is not limited to procedures on emanations/Tempest, ingress/egress, alarm systems, document control and storage, magnetic media handling, password and audit trails and terminals. STAT

VISITOR AND ACCESS CONTROLS ARE COMPREHENSIVE -- Procedures are in place to control access to the D/C Segment secure area and to maintain its secure integrity. A project access list will be posted near the ingress/egress point. A visitor's register will also be maintained near the entrance. Any individual not on the access list will be considered a visitor and will be required to register in and out. Prior to entry, the project member responsible for the visitor shall check the area making sure all material is secured and all classified discussions have ceased.

Plant facility protection officers are on duty at our [redacted] command post 24 hours a day, seven days a week. Normal duty coverage is four officers and one manager. The facilities are patrolled every one to two hours. Facility protection personnel are not SCI cleared and they do not have access inside the secure areas. They are, however, cleared at the DOD Top Secret level. STAT

Alarm annunciator panels are located at the command post. Response time from the post to any secure area is three minutes or less. Facilities Protection personnel have been provided specific written instructions including call lists for use if an alarm sounds.

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3.5 Issues

We continue to focus on programmatic options, baselined requirements, design assumptions, and the use of shared resources to identify opportunities for program cost and technical risk reduction.

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PROGRAMMATIC OPTIONS CAN REDUCE COST AND RISK -- Both the [redacted] Team and the Government have identified programmatic options that could reduce near-term program costs and minimize long-term technical risks in achieving the stated FOC requirements. These options are based on relaxing non-critical requirements at IOC, deferring development of the IWS until after IOC, or increasing utilization of the existing UNIVAC equipment for the IOC solution. Analysis of these options is contained in Section 8 of this document and in Section 10 of the Technical Proposal. These options will be given continuous attention through the Segment Baseline Review and PDR. Figure 3.5-1 delineates the programmatic options, baseline requirements and design assumptions that warrant further investigation.

SEGMENT BASELINE REVIEW WILL RESOLVE OPEN REQUIREMENTS AND DESIGN ISSUES -- We propose a Segment Baseline Review within 60 days of contract award to reach agreement on segment requirements, design assumptions and other open issues. The purpose of this review is to resolve the existing five requirements issues which are described in Section 2.2 of the Technical Proposal. In addition, this meeting will solidify the design assumptions discussed in Section 5.1 of the Technical Proposal upon which the proposed schedule and cost are predicated. The design assumptions are primarily driven by inter-segment issues such as communication protocols and query language and to a lesser degree by segment design issues. Closure by the July 1982 SBR, or as soon thereafter as possible, seems feasible in view of the on-going work to resolve the issues even before all segment contracts are awarded. To promote this effort, we propose informal discussions with the contractors, SI and Government prior to segment awards, and early establishment of appropriate Interface Control Working groups.

CONTROL COST BY MAXIMUM USE OF SHARED RESOURCES -- Several resources exist, which if efficiently planned, can reduce cost and development time. In addition to full use of the existing Univac equipment, another opportunity for cost and schedule control exists in utilizing critical skills and experience of the System Integrator (SI) and Computer Services Division (CSD) personnel to carry out critical development tasks. This could be particularly valuable in converting DMS 1100 from version 6 to version 8 beginning in May 1982, and in updating documentation originally developed by the SI or CSD. We propose that a minimum of one SI and two CSD personnel participate in the conversion effort. Additionally, CSD could assume major responsibility for revising documents where little initial modification is envisioned, such as OASIS, XAU and XMN, and consultation in the revision of critical functions such as XES or XMS. This support could be a significant factor in cost and risk control.

Training and familiarization in the early and later stages of the program could be effectively accomplished by government or SI personnel with particular expertise in these areas. We anticipate that the government will conduct training courses in orientation of the facility, system and data base, as well as courses in familiarization with table driven software. Later on, the government could assume a major role in developing with the contractor the training plans for the new system.

Operations and maintenance is another area where government resources can be effectively applied to reduce cost and risk. We believe that maintenance of the system should be shared equally between the government and the contractor after acceptance in [redacted] Gradual phasing to 100% government maintenance by FY8[redacted]STAT is also envisioned.

A final area to be considered is the NDPO human factors lab. Extensive test and experimentation will be necessary to develop firm requirements for the IWS. The prime objective is to define requirements which optimize IA productivity to reduce NDS operations cost. We would augment the existing lab with work station hardware, and provide test planning and data reduction resources to examine critical design and human factors questions. This would couple the government's lab facilities and access to operational personnel with the contractor's equipment, testing and human factors resources.

MAINTAIN ACTIVE JOINT COST CONTROL PROGRAM -- During the DCP, cost control has been enhanced by the joint efforts of the government and the contractor to explore cost and risk reduction alternatives during reviews. This effort can be even more effective in the System Acquisition Phase by the use of monthly PCMS reports which will make visible incurred and projected costs. In addition, the [redacted] team will STAT conduct a review of all internal and government documentation requirements to reduce administrative overhead. We will continue to identify and assess cost reduction options, which will be reviewed with the government at the SBR, PDR and CDR. We are confident that this continuing focus can result in mutual government and contractor containment of costs.

Potential Areas To Reduce Cost and Technical Risk

Key Area	Issues Requiring Analysis	Action Plan [redacted]Analysis	Action Plan Gov't Analysis	Action Plan Resplution[redacted]STAT
Programming Options (Investigation)	• Relax Non-Critical Requirements • Implement Alternative IWS Development Plan A. Use Proposed IBM Plan For IWS B. Defer IWS Development To After IOC C. More Centralization of IWS Function D. More Utilization of UNIVAC 1100/8X For IWS • Use UNIVAC Configuration Through IOC	1 Apr 82 (BAFO)	1 May 82 (Award)	July 82 (SBR) Dec 82 (PDR)
Requirements Baseline (Stabilize)	• Interactive Query Response Time • Batch Query Response Time • Communications Protocol (Level 1-3) • Common NDS Query Language • Image Resolution ($1024^2 \times 512^2$)	1 Apr 82 (BAFO)	1 May 82 (Award)	July 82 (SBR)
Design Assumptions (Validate)	System Level Assumptions: • Protocols • Data Compression • Security • DD5600 Interface • C/I Image Down Loading • IWS Resolution • IWS Interfaces Segment Level Assumptions: • Bus Interface Ports • Disk Security • Data Restore Time • CAMS D/S Nomination	1 Apr 82 (BAFO)	1 May 82 (Award)	July 82 (SBR) Continue Review

Figure 3.5-1. Issues for Continuing Analysis

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PROGRAM CONTROL

Section 4

PROGRAM CONTROL

4.1 Plans and Methodology

The project management team has tailored a range of mature, in-place management systems and procedures to plan, monitor and analyze status of the D/C Segment development.

Figure 4.1-1 lists twelve management systems used by [redacted] and summarizes their feat STAT
Refined over many years, they represent a powerful set of proven procedures that are thoroughly understood and practiced by our people. When tailored to a customer's unique requirements, we believe that they rank among the most effective in the industry.* As indicated in the figure, we have drawn on this experience base in adapting the controls to NDS.

Because the bulk of the project team will be colocated in [redacted] many of th STAT
procedures will be applied to our subcontractors. The software development, quality assurance and configuration management procedures are examples; the subcontractors will be subject to our SW controls, QA and CM boards. In other areas -- such as cost and schedule reporting -- the subcontractors will use their own systems. We have reviewed these and they are effective and compatible with our own. Like ours, they provide visibility to the project team and NDPO.

CONCEPT	PROCEDURE/TOOL	AVAILABILITY FOR D/C SEGMENT	SELECTED EXPERIENCE BASE	DESCRIBED IN SECTION
Provide High-Level Visibility of Status of Schedule, Cost Performance and Resources	Project Master Control Plan (PCMP), Continuously Maintained Working Tool Used by All Project Personnel; Consolidates Information From Other Systems, Described Below.	Preliminary Version Will be in Place by May 1, 1982.	• Real Time Computer Complex (NASA) • Space Telescope (NASA) • ZIRPEL	4.1.2
Objectively Establish Validity of Project Plans	[redacted] Division Staff Formally Reviews Proposal Before Submission (per MI 10-24); Identifies Potential Risks to Executive Management; Independently Assures Ability of Project to Meet Proposal Commitments with Allocated Resources. Follow-up Project Management Review Will be Conducted After Award to Track Compliance and Assure Prompt Start-up.	SAP Proposal was Reviewed by Division Staff on February 19, 1982. Follow-up Review Has Been Scheduled Approximately 90 Days After Contract Award.	Formal MI 10-24 Procedures Are Used on all Larg[redacted] Projects. Examples Include: • GPS • DSM • D/C Segment; Design Competition Phase	2.2
Project Staffing Requirements; Acquire Staffing Commitments	Process Starts With [redacted] Strategic Plan; Establishes Priorities on New Business Acquisition Consistent With Overall Manpower Resources. Plan is updated Quarterly. Formal Allocation Process Involves: (1) Identifying Needs; (2) Endorsement of Staffing Plan; (3) Direction [redacted] (4) Commitment by Executive Management; (5) Assignment to Project; (6) Development of Off-Load Plans; (7) Timely Off-Load.	Process Has Been Implemented For D/C Segment	Used on All [redacted] Programs; Similar Procedures Used Throughout Corporation	6

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Figure 4.1-1. Features of Management Control Concept (Sheet 1 of 2)

*This was the assessment of [redacted] Commander, Air Force Satellite Con STAT
Facility, who reviewed the management systems and controls we are applying to the Data System Modernization (DSM) program. At [redacted] suggestion, [redacted] is preparing STAT
description of these systems that AFSCF plans to use for enhancing their own systems and those of their contractors.

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These procedures and tools enable the project manager to exercise firm control of the development process. By systematically tracking status viz-a-viz plans, they reduce the administrative load and cost of managing the effort and minimize the risk of schedule slips.

CONCEPT	PROCEDURE/TOOL	AVAILABILITY FOR D/C SEGMENT	SELECTED EXPERIENCE BASE	DESCRIBED IN SECTION
Maintain Firm Baseline Control	Project Configuration Control Board (PCCB) Chaired by Deputy Project Manager, Administered by Dedicated Operating Staff; PCCB is Supported by: (a) Segment Configuration Control Board that Provides In-Depth Analysis and Control of Software Issues; and (b) CCB and CM Procedures Implemented by For IWS. Operations-Oriented Documentation and Software Developed by Personnel Will be Controlled Through PCCB as if They Were Departments.	In-Place by May 1, 1982	CM Procedures Comply With MIL-STD-483 and are detailed in Management Instructions; are Used on All Projects Implementing CM Systems Similar to Those Planned For D/C Segment • DSM • ZIRPEL	4.4
Provide Early Visibility of System Capability	Incremental System Development Process For Software Incorporates Code Audits, Definitive Library Management Techniques, etc.; Provide Objectively Measured Milestones For Assessing Progress. Process Formalized in Software Standards Manual. All Software Engineers/Programmers Receive Formal Training In Process.	In-Place	Used on All Projects; Current Examples Include: • GPS • DSM • ZIRPEL	5.3
Project Technical Performance	Technical Performance Measurements (Per MIL-STD-499) System Identifies Critical Parameters and Prepares Planned Performance vs. Time Profiles; Measurements are Tracked and Variances are Formally Reported to Project Management and NDPO (CDRL 155).	Initial Set of TPM has been Identified; Additional Parameters Will be Tracked as Development Evolves.	• LAMPS • DSM	5.2
Plan/Control Costs and Schedules	• Program Control Management System (PCMS); Automated System per DOD 7000.2 Collects Charges and Displays Cost and Schedule Variance for Each Element in WBS; Employs "Earned-Value" Concept. • Critical Path Analysis.	Performance Plans Will be In-Place on May 1, 1982 for all Work Packages to be Opened in the First 90 Days.	Management Instruction Mandates Use of PCMS on All Cost-Type and Large Contracts; Currently Used on: • GPS • LAMPS • DSM • ZIRPEL • DSM • ZIRPEL	4.2
Assure Quality of Delivered Products/ Services	Formal Quality Assurance Standards and Procedures Comply With MIL-Q-9858A and MIL-S-52779A; are Formally Documented in FSD Product Assurance Manual. QA Program Places Heavy Emphasis on Software, Equal to That of Traditional HW QA. Audits Conducted by QA are Promptly Reported to NPIC (via CDRL 149).	Preliminary QA Plan In-Place on May 1; Final QA Plan Submitted Within 30 Days of Contract.	Product Assurance Manual is Used on All Projects, Per Management Insturction. Current Projects Applying QA System Include: • ZIRPEL • GPS • DSM • Space Telescope	4.3
Integrate Logistics Planning Into On-going System Development	Dedicated Logistics Support Engineering Group Reports to Integration, Test and Transition Department; Integrates Logistics Activities of Field Engineering and Subcontractors; Prepares and Implements the Maintenance and Logistics Plan (CDRL 123).	Preliminary M&L Plan Will be In-Place on May 1; Presented at PDR and Again at CDR. Preliminary Logistics Approaches Described in Proposal.	Similar ILS Procedures/Techniques Have Been Used on Other Ground Data Handling Systems, Including: • DSM • GPS • Space Shuttle Data Processing Center (NASA)	4.5
Control of Incoming and Delivered Documentation	Formal, Data Management System With Automated Support Records, Routes, Stores Correspondence With NDPO, SI and Other Segment Contractors. Tracks Events Leading to Delivery of CDRL Items and Other Documentation; Reports Status to PMCP.	May 1, 1982	Segment Data Management Will be Patterned After System Successfully Being Used on GPS, DSM and ZIRPEL.	N/A
Monitor Subcontractors	• Assignment of Experienced Professional as Subsystem Acquisition Manager, Single Point of Contact For Subcontractors. • Subcontractors Invoke Own Management Systems (Similar To Those Described Fo to Plan/Track Efforts and Report • Frequent Inspection by Assures Compliance With Specifications and Provide Assistance as Needed On Problems.	Requirements For Tracking and Reporting Have Been Included in Subcontractor SOWs.	• GPS (Subcontract Value: • DSM (Subcontract Value • LAMPS (Subcontract Valus:	3.3
Reviews	• Daily and Weekly Internal Reviews to Maintain/Update PMCP. • Monthly Reviews by Executive Management. • Periodic Advisory Council Audits. • Frequent Formal and Informal Reviews by NDPO.	Schedule of Reviews Will be Established by May 1, 1982	Similar Review Procedures Are Used on All Our Programs.	N/A

Figure 4.1-1. Features of Management Control Concept (Sheet 2 of 2)

4.2 Cost and Schedule Control

The D/C Segment management team maintains firm control of project costs and schedules using [redacted] Program Control Management System (PCMS) and comprehensive schedule management tools emphasizing our Program Master Control Plan (PMCP). STAT

4.2.1 Program Control Management System (PCMS)

The PCMS system provides detailed cost tracking and schedule analysis through the earned-value concept. PCMS is an integral part of [redacted] management control process. STAT
The Division's system was first certified as meeting the requirements of DODI 7000.2 in 1972 and that certification was extended to [redacted] in 1975. Because we STAT
have found it so valuable, we use PCMS on all our major cost-type government programs, even if the contract does not specifically mandate it. Figure 4.2.1-1 lists typical recent applications, among them ZIRPEL, DSM and LAMPS.

PCMS encompasses three steps: planning, tracking and corrective action. Planning begins with the definition of the Work Breakdown Structure (WBS) and the program organization. With the approval of the Project Manager, Work Packages and Cost Accounts (logical groupings of Work Packages) are assigned to individual managers. For each Work Package, a Performance Measurement Plan is prepared which defines the work to be accomplished, the time-phased budget and the schedule. The Plan also defines intermediate milestones that establish the basis for objectively assessing progress and computing earned-value.

PROGRAM NAME	AGENCY		
DSM	AIR FORCE		
GPS	AIR FORCE	WILD WEASEL	AF
LAMPS III	NAVY	ASIT	AF
AN/BQQ-6	NAVY	GSSI	AF
E-3A	AF	CELTS	AF
CCSE&I	NAVY	PAVE PAWS	AF
SPS	AF		
STM A U	NAVY	B52 G/H	AF
CUTTY SARK	NAVY	SHF–TDMA	AF
SACDIN	AF		
ZIRPEL	CLASSIFIED	B52D	AF
PLSS	AF	SDPC	NASA
COBRA JUDY	AF	Space Telescope	NASA
SRK	AF	Space Lab Integration	NASA
RAPLOC	NAVY	AN/BQQ-5 RAM	NAVY
DWS	NAVY	CITE	NASA

Figure 4.2.1-1. [redacted] Programs That Use PCMS STAT

EARNED-VALUE CONCEPT -- Milestone definition is the critical step in the process. In developing Performance Measurement Plans, our approach is to break each task down into its component steps and to allow earned-value to be claimed only as each step is achieved. For example, for a systems engineering task, such as preparing a development specification, earned-value plateaus and completion dates might be established for intermediate milestones such as:

a. Prepare draft specification and obtain critique of Development and Integration, Test and Transition departments. Percent complete increment: 40.
b. Prepare presentation package for NDPO review. Percent complete increment: 10.
c. Revise, complete and submit draft for formal approval. Percent complete increment: 30.
d. Modify draft and complete specification. Percent complete increment: 20.

Similar checkpoints are established for the development of each element of D/C Segment hardware, software and operations documentation and for each test and verification, and installation, checkout and test activity. For each Work Package, the performing manager and his manager analyze the tasks to be accomplished, establish the meaningful earned-value criteria and record them in the Performance Measurement Plan. The manager's ability to meet these commitments is the principal determinant in his personal promotion and salary program.

Historically, the ability to assess earned-value for software development has been a recurrent, industry-wide problem. At [redacted] we have virtually eliminated this problem STAT by our formalized use of design and code inspections and our library promotion controls. As described in Section 5.3, these controls provide the objective, measurable milestones that allow us to track and project software tasks as accurately as we do other tasks.

PCMS COMPUTES THE CRITICAL VARIANCES -- Monthly, PCMS uses the earned-value and Estimate-to-Complete determinations to provide management with a comprehensive assessment of progress. For each Work Package, PCMS computes three measures of cost/schedule performance:

a. Schedule variance shows how well the program is on schedule. Measured in dollars it is derived by subtracting the Budgeted Cost of Work Scheduled (BCWS) from BCWP, Budgeted Cost of Work Performed.
b. Cost variance highlights potential overruns and underruns. It is derived by subtracting the Actual Cost of Work Performed (ACWP) from BCWP.
c. Completion variance is a comparison of the estimate-at-completion (EAC) with the total authorized budget.

Whenever a variance falls outside a pre-established range, the responsible D/C Segment Cost Account manager is required to explain the discrepancy to Project Manager [redacted] STAT [redacted] and to present a corrective action plan. On approval, it is incorporated in STAT the Project Master Control Plan (PMCP) and tracked. Together with other PCMS reports that summarize all charges to each Work Package, the monthly variance reports provide complete visibility of cost and schedule status for the performing managers, the Project Manager and [redacted] executive management. STAT

The same PCMS data also provides program visibility to NDPO; PCMS provides the data we use to prepare the Monthly Financial Report (CDRL 109).

MANAGEMENT RESERVE -- In the monthly PCMS review process, the Project Manager also monitors the Management Reserve. The reserve is established to cover unanticipated work; it enables the project to react quickly to unforseen tasks without the burden and delay associated with rebudgeting unaffected activities. The Project Manager has sole authority to commit these funds, but only to cover unplanned work; the Management Reserve is never used to correct variances. Variances are carried on the record and can only be rectified by subsequent savings. Inasmuch as each manager's personal appraisal is based on his performance, this discipline motivates managers to meet their cost and schedule commitments.

TAILORING PCMS FOR SAP. We have taken the following steps to implement PCMS immediately upon contract award:

a. The WBS has been developed to a detailed level, containing more than 1,000 elements, as shown in the Cost Proposal. We have reviewed the WBS of our subcontractors and have determined that they are sufficiently finegrained to provide us and NDPO with clear visibility of their work.
b. The program organization and the subcontractor structure have been established.
c. Budgets by WBS have been developed as part of the Cost Proposal.
d. Performance Measurement Plans are being detailed and will be in place at contract award for all Work Packages that are to be authorized during the first 90 days. Other plans will be developed as new Work Packages are initiated.
e. We have imposed compatible cost/schedule management requirements on our major subcontractors, as discussed below.
f. Responsibility for cost and schedule control administration has been assigned to an experienced administrator reporting to the Project Control Office. He will be assisted by a staff of dedicated analysts.

SUBCONTRACTOR PROJECT COST CONTROLS -- To ensure consistent cost performance reporting, [redacted] has required its subcontractors also to use 7000.10-compatible cost/schedule reporting procedures. The subcontractors will develop their detailed WBS, deliveries and schedules to key with [redacted] They then develop formalized budget and planning packages, in accordance with [redacted] critieria for hardware and software earned-value milestones. As they are prepared, the subcontractors' work packages will be reviewed by [redacted] for consistency and correctness; upon completion they represent an approved set of comprehensive performance plans and establish a baseline for mutual monitoring of progress. STAT STAT STAT STAT

Each month our subcontractor cost account personnel determine earned-value for their tasks and assess them against associated costs. They prepare variance analysis data for activities that are outside of established thresholds. Using this data, Cost Performance Reports are prepared by the subcontractors at a level of WBS detail that is established by [redacted] The CPRs and VARs are delivered to [redacted] at least seven days prior to our own CPR and VAR submittals. We evaluate the subcontractors' submittals and aggregate them to the appropriate level for integration in the prime CPR. STAT

In summary, the PCMS to be used for the D/C Segment is a mature system, thoroughly documented and understood by all elements of our organiztion. An [redacted] Division-level STAT staff of approximately 20 specialists maintains the system, provides training to users and assists project managers and subcontractors in applying it. The staff also acts as an independent monitor to ensure that it is being used correctly. Figure 4.2.1-2 details the flow of transactions within [redacted] that PCMS encompasses. STAT

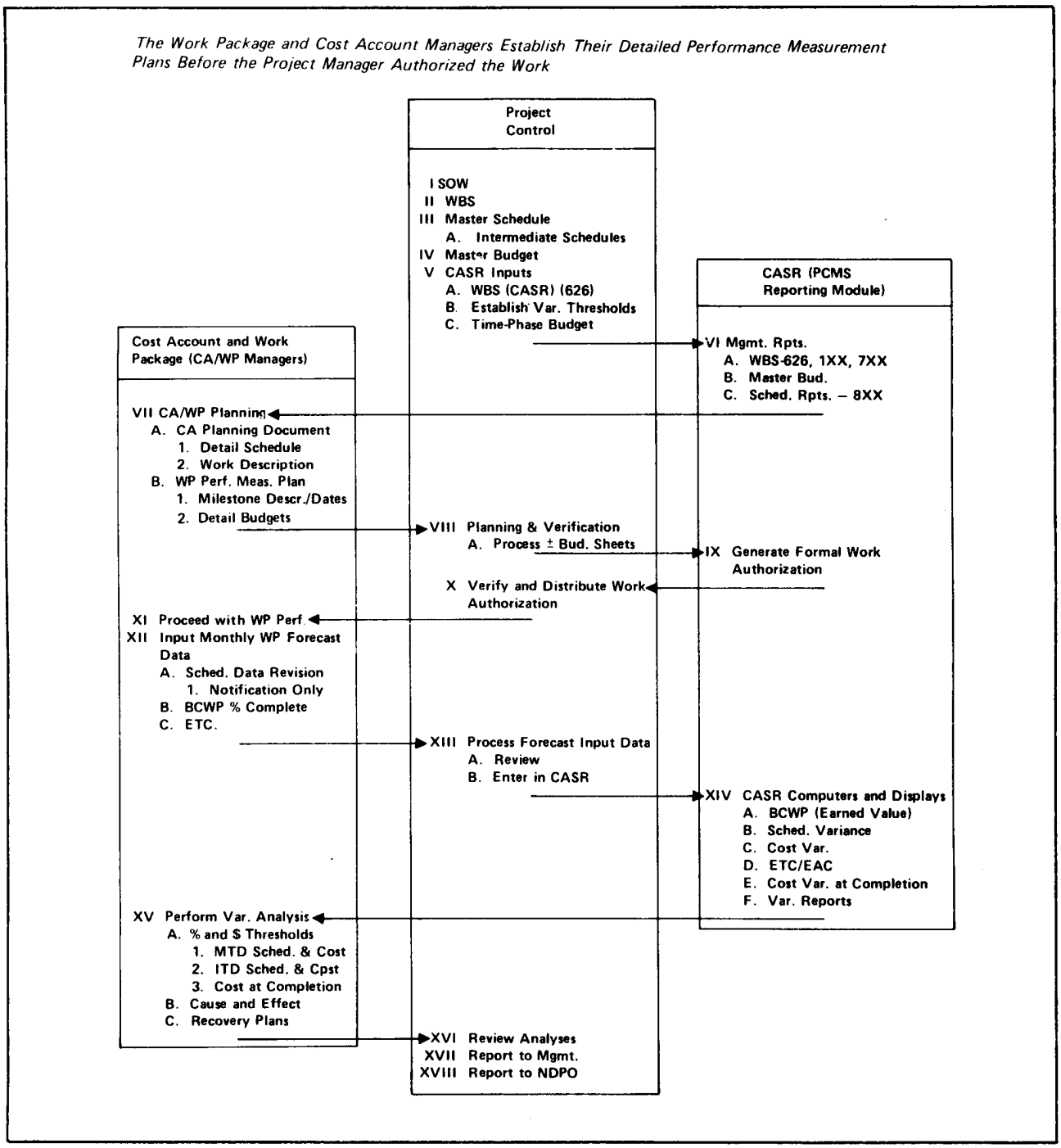

Figure 4.2.1-2. PCMS Documentation Flow and Responsibilities

4.2.2. Schedule Management

[redacted] *Project Master Control Plan (PMCP) is the crucial day-to-day working document that provides a controlled method to task, monitor and evaluate program activities.* STAT

THE PMCP IS USED BY ALL PROJECT MANAGERS FOR DAY-TO-DAY TRACKING OF SCHEDULES -- The PMCP consolidates in one place the schedule status of each element of the project. The plan may be viewed as a looseleaf notebook containing 12 sections, as shown in Figure 4.2.2-1. Each member of the management team is responsible for those portions of the PMCP that reports the status of the activities he directs. Weekly, each manager reviews those portions with all his subordinates and with his own managers. When problems arise, he describes them and sets out proposed solutions. Milestones and action items are recorded in the Plan and are tracked until they are closed out.

The concept of the Master Control Plan was first used on our NASA Houston Real Time Computer Complex project where detailed tracking was essential to coordinate the efforts of more than 500 [redacted] software and engineering specialists to meet the very tight Apollo STAT and Gemini schedules. The idea has since been expanded and has been used on many other programs; ZIRPEL, DSM, GPS and Space Telescope are current [redacted] examples. We STAT have found that the process of maintaining the Plan through regular weekly meetings develops a sharp awareness among team members of how their activities relate to others on the project. The synergism achieved contributes to early problem identification and resolution. The wide-spread dissemination of the PMCP also helps in motivating people to meet their commitments.

Each manager breaks down his assigned tasks to a low level, listing well defined milestones with planned completion dates. These are then entered into the PMCP with columns available for tracking revisions to the target dates and actual completion dates. Because it is in list format, it can be updated easily on the computer, lending itself to a weekly review and update process. This frequent review, update and dissemination is the reason it is such a powerful tracking mechanism.

Each manager holds and maintains an updated copy of the PMCP and uses it as the focus and agenda for his weekly review meetings with his subordinates. Following the meeting, marked-up change pages are submitted to the Project Management Office which updates and distributes copies to all PMCP holders. Revisions are accomplished using a SCRIPT automated data base. PMCP information is also accessible via terminals. This feature is particularly useful for executive management overview.

The same information is also available to NPIC personnel. As it does for internal meetings, the PMCP serves as a focal point for reporting and discussions with NDPO. Just as it has for other customers, it will assist NDPO in maintaining total visibility of our status.

A preliminary version of each section of the PMCP will be in place on contract award. We will revise them to reflect negotiated changes and will include the final, completed formats as an appendix to the Development Plan, CDRL 104, that we will submit to NDPO within 30 days.

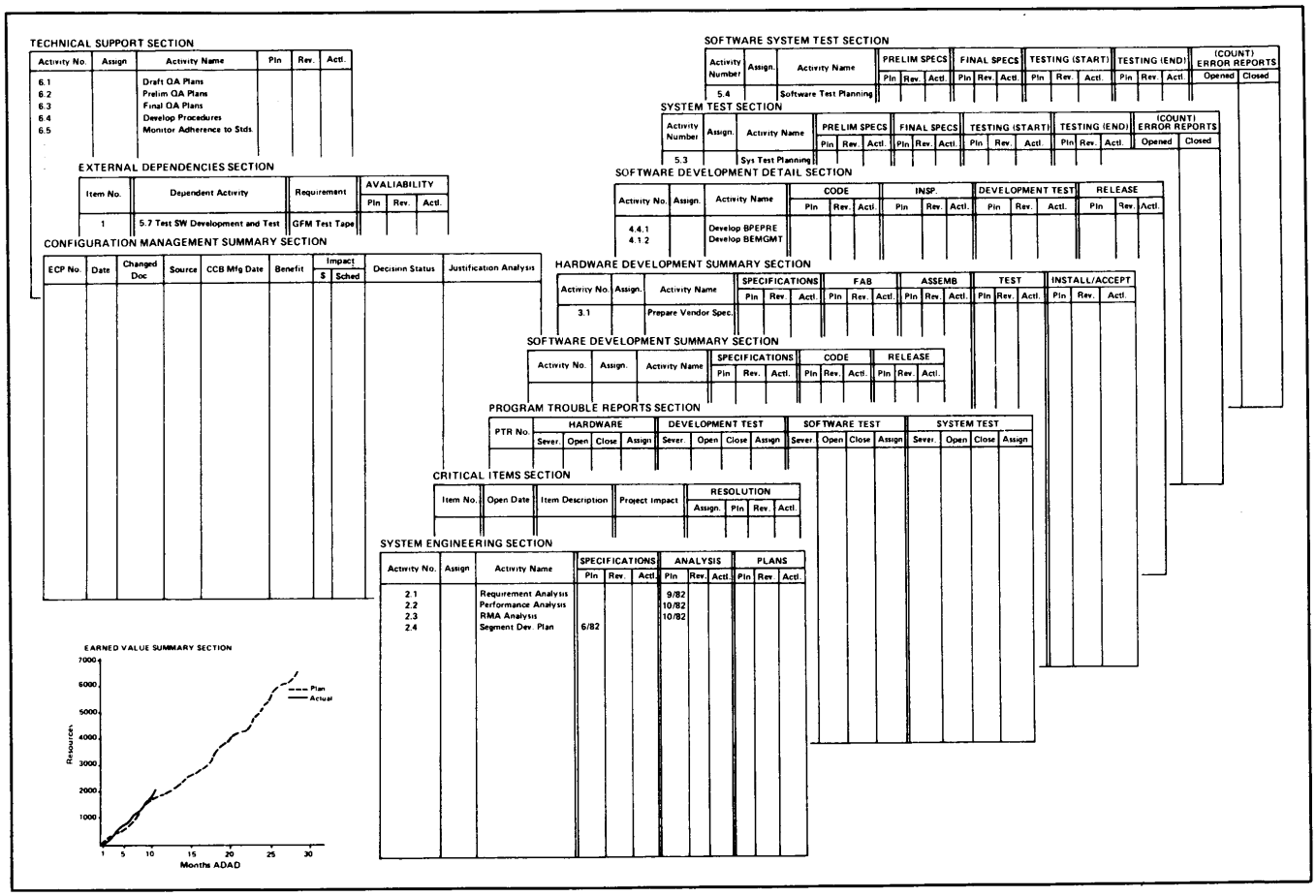

Figure 4.2.2-1. Sections of the Project Master Control Plan (PMCP)

FOCUSING ON SCHEDULE INTERDEPENDENCIES -- In addition to PMCP, [redacted] uses another management tool to identify activity interdependencies: Project Management System (PMS IV), an [redacted] program product, together with E-Z Pert, a versatile plotter program to maintain our activity networks and analyze critical paths. We are currently using these systems -- both mature, commercially available products -- on our DSM contract and we will draw on that experience for the D/C Segment. STAT STAT

Examples of the kind of products generated are shown in Section 5. Gantt charts and activity networks developed by the system are used at the PMCP meetings; rescheduling decisions are fed back to PMS. Outputs are formally submitted to NDPO via the Master Schedule report, CDRL 103.

TREND ANALYSIS PROVIDES ADDITIONAL INSIGHT INTO PROGRAM STATUS -- As a project progresses, valuable project status information can be obtained by tracking key parameters.

For example, as specifications are written and baselined at design reviews, the number of open items identifed after baselining and their status provides insight into specification stability. Similarly, the number of Request For Changes (RFC's) and Engineering Change Proposals (ECP's) written each week and the number of ECP's currently under consideration provide good insight into requirements stability. During software development, the number of software modules on the master system can be tracked; also, the number of Problem Trouble Reports (PTR's) being written each week and the total number not yet corrected provide insight into the quality of the system. This type of trend analysis provides good insight into the system status.

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4.3 Quality Assurance

Quality is built into the D/C Segment by the entire project team, through our design, development and test procedures. The Quality Assurance organization monitors the work to see that these procedures are properly applied; they have an independent channel to the [redacted] President to signal deviations. STAT

For many years, [redacted] has played a precursor role for the Corporation in meeting particularly stringent quality requirements, characteristic of advanced hardware/software projects. Examples include Apollo and Shuttle, the FAA air traffic control system, GPS and DSM. Many of the procedures developed by [redacted] have been adopted throughout the company. STAT STAT

The prime responsibility of [redacted] QA is to assure that products delivered to customers meet contractual requirements and [redacted] own standards. Personnel performing QA functions have the authority and the organizational independence to identify and assess quality problems, and to initiate, recommend and provide solutions. Quality assurance for the D/C Segment will be provided by a single Product Assurance department that will oversee hardware and software and operations documentation deliverables. STAT STAT

While working closely with the project team, to preserve complete objectivity the department reports through a separate, independent management chain to the FSD President. This organizational structure is consistent with MIL-Q-9858A and MIL-S-52779A and has been used effectively on other major projects, among them GPS, DSM and ZIRPEL.

QA ENCOMPASSES ALL SAP DELIVERABLES -- QA control covers the off-the-shelf ADPE and software and the custom-built software/firmware. QA control also extends to the subcontracted IWS and its software/firmware, as well as to the [redacted]-developed software and operations documentation. QA reviews and audits will be conducted throughout the life of the project. As examples, early in SAP QA will audit the CM program for compliance with the CM Plan. As hardware and software elements are developed, QA will audit compliance with standards and procedures, non-conformance controls and subcontractor efforts. Audits will be documented and reported to NDPO, as CDRL 149. STAT

Specific QA functions and schedules will be detailed in the QA Plan which will be submitted 30 days after contract award, as CDRL 108. The Plan is based on formal, proven policies, instructions and procedures that are detailed in the [redacted] Product Assurance Manual. The Manual covers all the QA aspects spelled out in MIL-Q-9585A and MIL-S-52779A. STAT

HARDWARE QUALITY ASSURANCE (HQA) -- Figure 4.3-1 identifies the HQA functions to be described in the QA Plan.

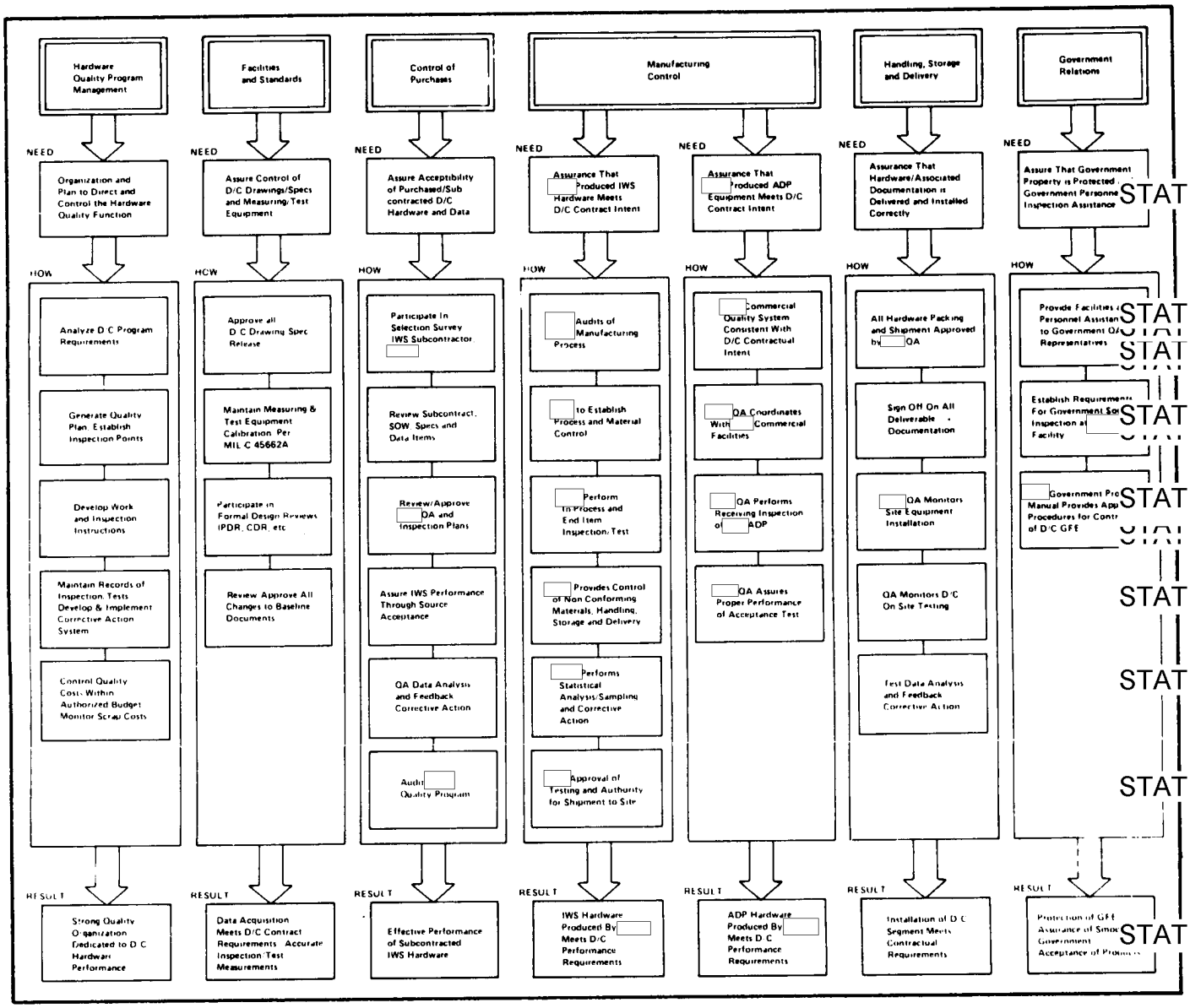

Figure 4.3-1. HQA Process

As an integral part of [ ] Corporate-wide QA organization, [ ] HQA function will coordinate with [ ] commercial plants on any quality issues that may arise on the Segment ADP equipment and software.

HQA will monitor [ ] IWS hardware development. As part of the IWS selection process, HQA visited [ ] plant where the equipment will be assembled and we surveyed their QA procedures. We verified that their program will be consistent with MIL-Q-9858A. As with our own QA organization, the [ ] QA manager does not directly report to the [ ] Project manager, but to the Vice President and General Manager of Eastern Operations, the Project Manager's superior. Provisions for stringent quality control have been incorporated into [ ] subcontract. We require [ ] to submit QA and inspection plans for our review. When approved, these will be included as an appendix to the Segment QA Plan that we will submit to NDPO.

The proximity of the [ ] IWS manufacturing facility to [ ] will foster continuing visibility of their work by [ ] HQA. As we do on all our major subcontracts, we will make frequent visits to see that [ ] QA functions remain strong. Should problems arise, our HQA personnel will provide support as required to assure the quality of the delivered equipment.

HQA also acts for the Project Manager in effecting formal control of government furnished property. Working with the Configuration Manager and the [ ] Government Property Administrator, property provided by NPIC for the Development and Test Laboratory or for other purposes will be controlled as GFP in accordance with [ ] DCASO-approved Government Property Manual. The manual covers procedures for inspection upon receipt, identification, periodic damage inspection and coordination with the appropriate government agency when the material is to be transferred back to government control or in the event that damage occurs.

SOFTWARE QUALITY ASSURANCE (SQA) -- [ ] established Software Quality Assurance (SQA) process applies quality control to each element in the software/firmware development process. SQA's role is built into our software development process; responsibilities and working procedures are formally taught to and understood by all [ ] software personnel. The SQA process is currently being applied successfully on other demanding software projects such as DSM, GPS and ZIRPEL. The methodology is well documented and backed up by both [ ] Corporate and [ ] policies.

SQA representatives work with the software development and test teams right from project start. Figure 4.3-2 details the functions incorporated into the SQA process.

The SQA procedures we use for our own developments will also be applied to our resident subcontractors, [ ] Their personnel will work in [ ] quality standards and criteria, and will be monitored using the same [ ] SQA procedures. Subcontractor personnel will receive formal training in our procedures. We are confident that this unified QA approach will increase the reliability of the code and will minimize the possibility of schedule slips.

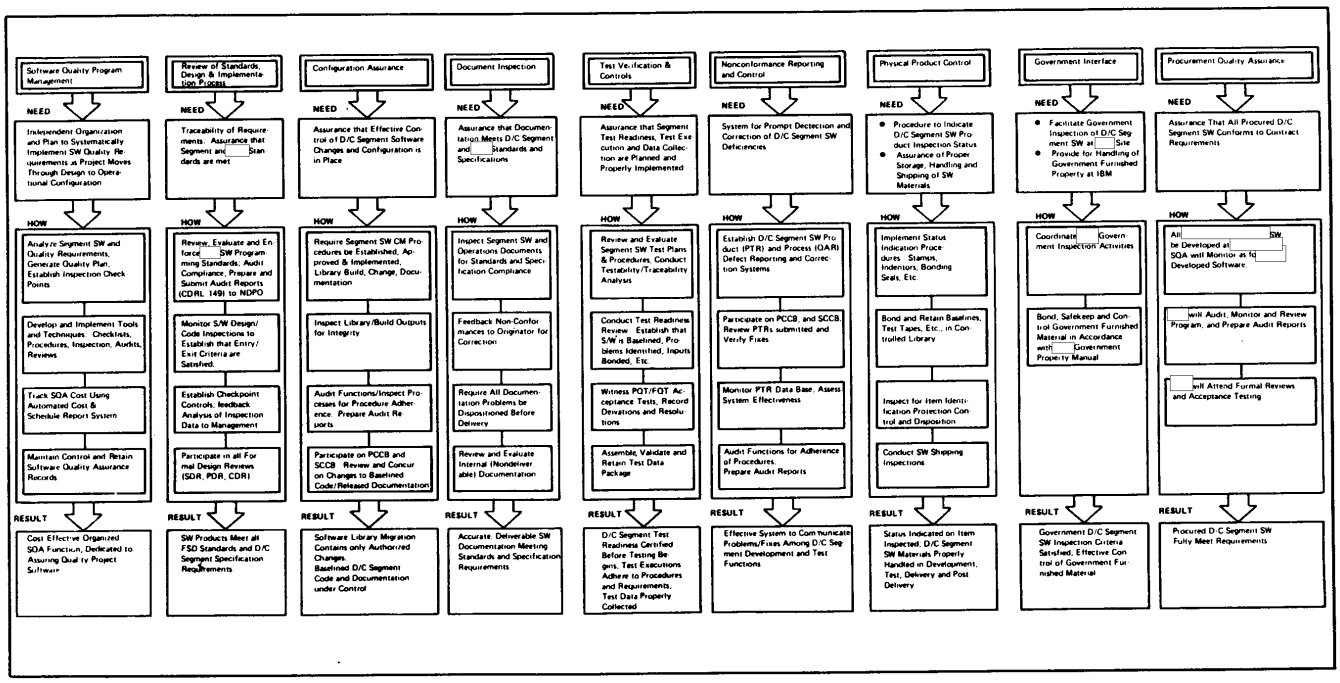

Figure 4.3-2. SQA Process

4.4 Configuration Management

We have adapted our standard CM procedures to NPIC's Program Implementation Directive (PID), to provide effective internal control of our deliverables and assure a smooth transition with on-going operations.

The objective of the configuration management function is to establish, control and report the status of project baselines. In developing our configuration management procedures for the D/C Segment, we have drawn on an extensive base of CM experience with other ground data management systems, for the Air Force, NASA and the Intelligence Community. We have tailored these procedures to be fully compatible with NPIC's CM approach, as defined in the Program Implementation Directive (PID). As examples: we conform to NPIC's four SAP baselines (Preliminary, Control, Verification and Operational Configuration); we recognize the points in the development where formal control passes to NPIC configuration management boards; and our change procedures are consistent with NPIC's.

We have structured our procedures so that they allow a fair degree of freedom to the designer in the early stages of the design, increasing the level of control as the development process evolves.

A preliminary draft of the Segment Configuration Management Plan has been prepared and will be submitted as CDRL 106, within 30 days of contract award. The following paragraphs present an overview of the key elements of the plan.

ORGANIZATION -- [redacted] Deputy Project Manager, will be the Configuration Manager, responsible for identifying and establishing configuration baselines and for controlling engineering changes to them. He will: STAT

a. Ensure that CM procedures are defined, understood and followed;
b. Chair the Project Configuration Control Board (PCCB);
c. Interface with NDPO on all CM reviews, ECPs, status reports, etc.; and
d. Participate in interface control working groups (ICWG) as directed by NDPO and the System Integrator.

A Configuration Management Office (CMO) within the Project Control department is responsible for administration of CM activities. Among its duties, it prepares and maintains the CM plan, coordinates CM procedures, provides agenda and minutes of PCCB meetings and expedites change evaluation and review. [redacted] heads the CMO. STAT
He served the same role on our $300 million AN/BQQ-5 sonar program and played a lead role in developing the [redacted] Configuration Management Manual, now the Division CM standard. STAT

The Project Control, Subsystem Acquisition and Product Assurance managers, and the managers of Systems Engineering, Hardware and Software Development, and Integration, Test and Transition departments are members of the PCCB. The organization and functions of the PCCB is shown in Figure 4.4-1; its role in controlling changes is discussed below.

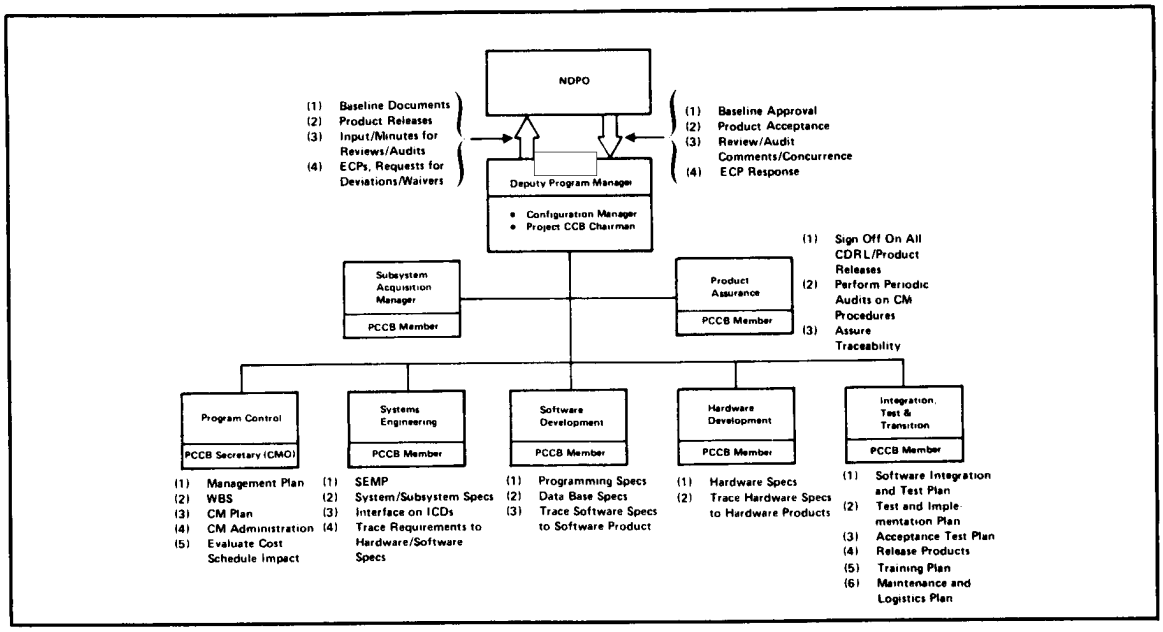

Figure 4.4-1. D/C Segment Project Configuration Management Organization

CONFIGURATION IDENTIFICATION -- Configuration identification is established for every hardware configuration item (CI) and computer program configuration item (CPCI) and for each operations element--H/S/O--in the form of technical documentation.

The documentation identifies and controls the development of the H/S/O and represents project baselines that establish the approved, defined points of departure for controlling subsequent changes. To be a baseline document under [redacted] CM control, an enti STAT must be: (1) a definitive product, i.e., a CDRL item; (2) traceable to a previous baseline; (3) reviewed by [redacted] and approved by the [redacted] Project Manager and Product STAT Assurance; and (4) approved by the NDPO.

In developing baseline documentation [redacted] will proceed through the following general STAT steps: (1) prepare a draft; (2) perform internal project review and initial quality assurance; (3) review with NDPO; (4) incorporate comments and updates into a preliminary version; (5) obtain Project Manager and QA approval; (6) submit to NDPO for review; (7) perform internal dry run for formal NDPO presentation; (8) present to NDPO and get preliminary baseline approval with comments/exceptions; and, finally, (9) resolve comments/exceptions and release the final approved version of the document.

Figure 4.4-2 is a preliminary listing of D/C Segment baseline documents. There will be 17 CPCIs and one CI. As indicated, the baselines will also contain operations documentation, such as the Segment Operations Specifications and Operations Manual as well as plans, such as the Maintenance and Logistic Plan. The latter are submitted to NDPO by the responsible preparing department and are modified as required before they are approved. To assure uniform application of the plans throughout the project, the approved versions will be released by the CMO. Should subsequent changes impact controlled documents, the change requests will be coordinated by the CMO through the PCCB.

For commercially available hardware, the commercial documentation, nomenclature and serial numbers will be used.

CONFIGURATION CONTROL -- Proposed changes to an NDPO-approved baseline document will be controlled in accordance with the CM Plan. Class I changes will be submitted through the PCCB to NDPO for approval, as described below. Class II changes will be implemented by [redacted] we will notify NDPO in each case and obtain NDPO's concurrence with our classification. STAT

The principal documents used by [redacted] CM for change control are the: (1) Engineering Change Proposal (ECP); (2) Specification Change Notice (SCN); (3) Problem Trouble Report (PTR); and (4) Corrective Action Report (CAR). The ECP and SCN are used to document and control changes to all baseline documents. The PTR and CAR are used to track changes to the hardware and software after they have been submitted to testing. We believe that our standard documents are compatible with NPIC's; we are prepared to modify ours, if needed, to conform completely with NPIC's nomenclature and formats. Processing of these documents is described below. STAT

CHANGE CONTROL BOARDS AND PROCESSING FLOW -- For the D/C Segment, [redacted] will establish two change control boards. The principal board, the Project Configuration Control Board (PCCB), reviews and evaluates all changes (SCNs) to customer approved baselines. The second board, a subset of the first, is the Segment Configuration Control Board (SCCB). It reviews and evaluates all changes (PTRs) to the hardware and software baselines after they enter test. In addition, the SCCB monitors software library promotions and provides in-depth analysis/advice to the PCCB on segment software configuration issues. Figure 4.4-3 shows the interrelationships of the boards. STAT

After a document is established as a NDPO-approved baseline or the hardware or software goes into testing, changes are controlled by the PCCB/SCCB using the ECP/SCN/PTR processing flow shown in Figure 4.4-4. As indicated, change processing for a PTR is similar to that for an SCN. During PTR evaluation, an assessment is made whether the PTR requires a baseline document change. If so, an SCN is generated and the evaluation is elevated to the PCCB. Those PTRs requiring SCNs cannot be corrected unless the associated SCN is approved.

To coordinate approval and implementation of changes in a suitably rapid time-frame, particularly those directed by NPIC, we will establish a priority system parallelling that in effect at NPIC. The priority criteria will be:

Emergency - Critical to security, hazardous conditions or mission failure. To be implemented as soon as possible, not later than 24 hours from initial report.

Urgent - Affecting mission effectiveness and product quality, potentially hazardous conditions or significant contract requirements. To be implemented within 7 days.

Routine - Changes falling outside of emergency and urgent priorities. To be implemented within 21 days.

Our CM Plan will detail the responsibilities and specific procedures--including means for temporary patching--that we will implement to meet these turn-around times.

Segment Design Specification	CPCI Listing (As Built)
Segment Operations Concept	Data Base Packages
Requirements Traceability and Verification Matrix	Segment Programming Standards and Conventions
CPCI Part I/II Specifications (17)	Data Dictionary
CI Specification (1)	User Manual
Component Specifications	Operators Manual
Data Base Specification	Data Base Administrator Manual
Operations/Software Interface Specification	Programmers Manual
Operations/Hardware Interface Specification	Equipment Operation and Maintenance Manuals
Hardware/Software Interface Specification	Segment Transition and Integration Plan
Software/Software Interface Specification	O&M Plan
Facility Interface Drawings	M&L Plan
Segment Operations Specification	Segment Test Plan
Software Version Description Documents	Segment Installation Plans
	Training Plan

Figure 4.4-2. Preliminary Listing of CM-Controlled Documentation to be Prepared

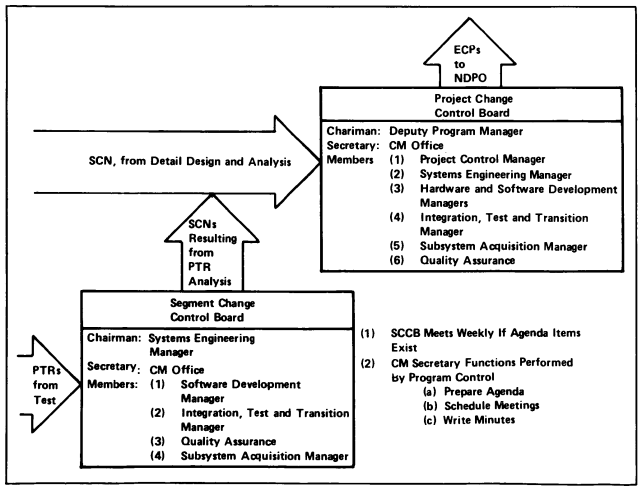

Figure 4.4-3. Relationship of D/C Segment Change Control Boards

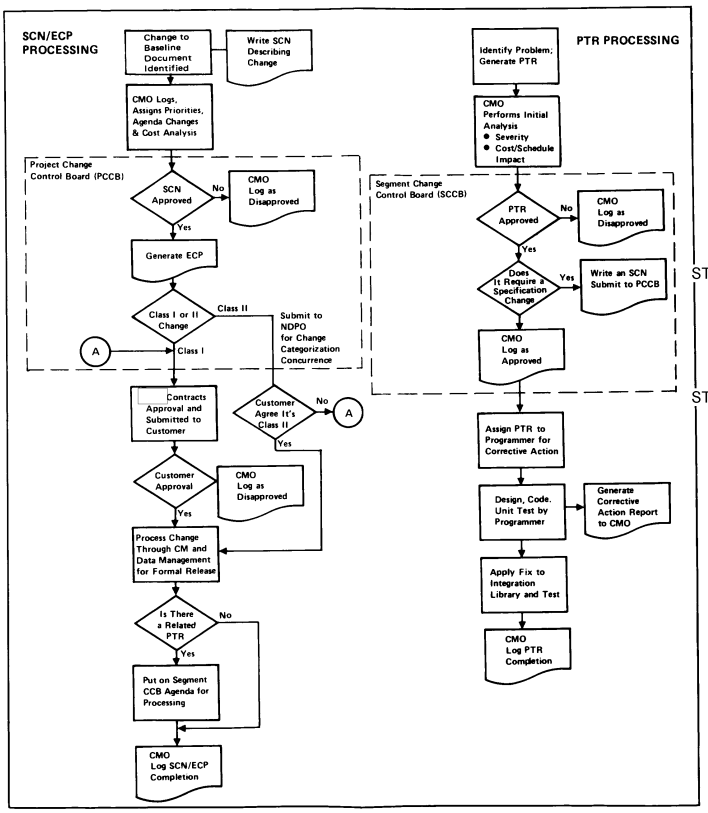

Figure 4.4-4. Change Processing Flow

SUBCONTRACTOR CONFIGURATION MANAGEMENT - [redacted] software activities will be conducted in [redacted] and will be subject to the same CM (and QA) procedures we apply to the baseline documents we develop ourselves. For hardware development of the IWS, [redacted] will establish its own Subcontractor Configuration Control Board to control internal design activities and to interface with [redacted] PCCB on changes to [redacted] approved baseline documents. Both [redacted] have extensive experience in subcontract CM; a fully compatible set of procedures will be developed in a subcontractor CM Plan that [redacted] will prepare and submit for [redacted] approval. We will include that plan as an appendix to the Segment CM Plan (CDRL 106).

STATUS ACCOUNTING -- The current status of all baselines will be recorded in the CI/CPCI index using in-place, automated configuration status accounting procedures. On a monthly basis [redacted] will prepare: (1) an updated index of the current H/S/O baselines; (2) a configuration item development summary of all CI/CPCIs in progress; (3) a description of technical documentation comprising the configuration; and (4) an update of the status of outstanding ECP/SCNs.

CONFIGURATION AUDITS AND PRODUCT CONTROL -- Following testing of H/S/O products and before delivery, the CMO will assist NDPO and the SI in conducting configuration audits to verify that the products satisfy specified requirements and that the as-built versions are accurately described by the documentation. Working with Product Assurance, the CMO will ensure that a master version of every deliverable H/S/O product is maintained and controlled. Formal product control will also be applied to copies of baselined products that we receive from NDPO.

INTERFACING WITH THE SYSTEM INTEGRATOR AND OTHER SEGMENTS -- As soon as we are authorized to do so, we will formally establish working relationships with the SI and other segment contractors to exchange data and facilitate surfacing of problems. We have learned from other programs the importance of cooperatively addressing intersegment issues. Our policy, which we effectively instill in all our people, is to deal with intersegment issues on a non-parochial basis, to find the best total system solution. We apply strong management direction to resolve discrepancies at the working level. On the LAMPS MK III program, for example, more than 80 percent of the airframe interface issues were settled at the working level.

[redacted] will designate specific individuals as initial points of contact for interface questions. In turn, they will task others in our organization, including our subcontractors, to provide the information requested or to participate directly in technical discussions, including day-to-day follow-up exchanges. Significant interchanges will be recorded in contact reports which describe issues discussed, conclusions, and agreed upon follow-on activity. These will be distributed to the NDPO and segment contractors and to effected team personnel. Critical issues and important discrepancies uncovered in our discussions will be promptly brought to the attention of NDPO by Project Manager [redacted] As provided by the contract, results of discussions that affect formally approved plans, schedules or costs will also be submitted to the NDPO Contracting Officer. Resolution of problems that impact controlled documentation will be handled in accordance with our configuration management procedures.

For the initial SAP efforts, we have designated Systems Engineering Manager [redacted] STAT
[redacted] working with [redacted] Deputy Project Manager, as our lead interface. STAT
They will: (1) establish the [redacted] team's interface control organization; (2) STAT
establish interface working relationships; (3) participate with the SI in defining interfaces; (4) document and maintain interface agreements; and (5) monitor adherence to agreements.

To promote the most effective open discussions with the SI and segment contractors, we are prepared to negotiate formal proprietary information exchange agreements as may be required.

4.5 Logistics Management

Our logistics planning integrates maintenance and other logistics requirements into the design process and provides for continuous effective support to NDS.

[redacted] has extensive experience in providing logistics support for critical data handling systems comprising commericial and specially-built equipment and software. Unclassified examples includes the NASA Shuttle Data Processing System and the Air Force Data System Modernization program. Lessons learned on these programs will be applied in the development, planning and implementation of the D/C Segment and will be reflected in the Maintenance and Logistics Plan (MLP) (CDRL 124). Figure 4.5-1 provides an overview of the activities to be covered in the plan, shows responsibility among the [redacted] team and indicates the preliminary concepts we are considering. It also identifies the analyses, studies or trade-offs we will conduct.

MANAGEMENT OF SPARES, REPAIR PARTS AND CONSUMABLES -- The spares support program will be required to support both newly developed equipment (IWS) as well as off-the-shelf commercial equipment. Each has unique support requirements.

The spares requirements for the IWS equipment will be defined by [redacted] in an iterative process involving Maintenance Concept Definition, Logistics Support Analysis (LSA), Repair Level Analysis (RLA) and associated cost trade-offs. The end products of this analysis are a definition of the initial spares inventory required to support the equipment both on-site and at backup depots, spares repair and repair locations, lead times, consumable requirements, and dispensation of non-repairable (throwaway) spares and associated costs of these items.

[redacted] will use the Spares Optimization Program to identify spares sets which support optimum system availability at the least cost. This program will be used to help define initial stocking of parts for newly designed equipment. As spares usage data becomes available, these data will be used to modify subsequent optimization runs and replenishment decisions.

On-site spares will be stocked as required to support maintenance of the hardware and any additional spares required due to special security needs. Spares requirements for [redacted] commercial equipment support are well defined and replenishment and emergency parts are stocked in the [redacted] Parts Center in Washington, D. C. Supporting the Washington Center is a network throughout the United States, including the [redacted] Bulk Distribution Center [redacted] Parts usage will be continuously analyzed and parts reordered using the Parts Inventory Mangement System (PIMS) provides a sophisticated forecasting and ordering routine to help provide availability of needed parts. Parts requirements for the Washington Center are predicted several weeks in advance by the PIMS system based on part usage trend analysis. PIMS also locates Emergency parts in the nearest stockroom within the parts distribution network.

Spares, repair parts, and consumables designated as Government Furnished Equipment will be identified prior to initial stocking and will be provided by the customer. These items will include those that can be provided most economically as GFE or are not readily available from other sources.

CATEGORY	ACTIVITIES	Team Responsibility					ALL	GFE	PRELIMINARY CONCEPTS	ANALYSES/STUDY/TRADE OFFS
1. SPARES, REPAIR PARTS AND CONSUMABLES	• Define Repair/Replace Philosophy	√	√						[redacted] Commercial Products • Remove/Replace FRU, Return to Manufacturer for Repair or Discard Per Standard Commercial Practice • Spare Per Standard Commercial Practice • Provide Initial Inventory at Installation Time • No GFE Items Identified • Replenishment Based on PIMS/USAGE Integrated Work Station • Remove/Replace Failed Item, Repair on Site, Return to Depot or Manufacturer for Repair or Discard • Sparing Philosophy to be Developed During Design • Initial Inventory to be Provided at Installation • Replenishment Based on Predictions Modified by Usage Operational Consumables • Printer Paper, Tape, etc. • Based on Historical Data • To Be Provided GFE	[redacted] Commercial Products • Study Modification of Standard Commercial Sparing Pract Because of Security Implications Integrated Work Station • Perform Logistic Support Analysis • Perform Repair Level Analysis • Determination of Spares Optimization Study Operational Consumables • Analyze Change to Replenishment Quantities Due to New Design
	• Define Sparing Philosophy	√	√							
	• Develop Spares List	√	√							
	• Define Consumables Management Concept		√	√	√					
	• Develop Consumables Plan			√	√					
	• Identify GFE Items					√				
	• Recommend Inventory Levels	√	√	√						
	• Lay In Initial Quantities	√	√					√		
	• Control Replenishment	√	√					√		
	• Provide Schedule				√					
2. SUPPORT AND TEST EQUIPMENT	• Define Support and Test Activities and Update		√		√				[redacted] Commercial Products • All Support and Test Equipment to be Provided Under Maintenance Contract Integrated Work Station • No Special Support Equipment Identified at Present • All Standard Support or Test Equipment to be Supplied [redacted] Segment Level Activities • All Presently Identified Requirements are Passive Units (Breakout Boxes, etc.) for Integration and Test Use Only. To be Supplied By [redacted]	Integrated Work Station • Trade Off Use of Modified IWS at Depot vs. Special Design Developed Support Equipment to Test Repaired Failed Items • Study Use of Breakout Boxes Used for Integration Tests as Maintenance Aids
	• Provide Inputs to Support and Test Equipment Detail Specifications		√		√					
	• Make, Buy or Request Support and Test Equipment as GFE		√		√					
	• Define Calibration and Provide Calibration Service		√		√					
	• Provide Schedule				√					
	• Manage Support and Test Equipment		√		√					
3. TECHNICAL DATA	• Definition of O&M Personnel Needs		√	√					[redacted] Commercial Products • [redacted] Commercial Manuals Will Be Provided Developed Manuals • Equivalent To Best Commercial Practices or Per CDRL • 8 1/2" x 11" Standard Page In Three Ring Binder. Fold Outs Used Only When Required • Reproducible Master Vs Camera Copy • Use of Script and Cadam To Reduct Cost • Standardize Text/Formats to the Extent Feasible • Severely Limit Illustrations to Reduce Costs • Provide TOCs and Outlines, Draft Preliminary, Preliminary and Final Versions • Due to Limited Distribution, Serialize Manuals for Revision Control • Update Via Dated Change Pages	Developed Manuals • Study and Trade Off Procedures in Software Versus Hardc • Study Use of 3" x 5" OPERATORS Handbook • Analyze Organization of IWS EOM - 1 Volume vs 3 Volumes, 1 Each By Type • Develop Procedure for Review of Operator and User Manuals By Entire Team as they are Generated by Inputs from the Entire Team
	• Description of All CDRLs and Their Content		√	√	√					
	• Description of Development Activities				√					
	• Updates		√	√	√					
	• Revision Control				√					
	• Provide Schedule				√					
4. TRANSPORTATION AND HANDLING	• Preliminary Activities and Updates				√				All Products • Delivery By Best Commercial Practices Except Classified Items • Transportation By Air Ride Padded Van • Comply with National Motor Freight Classification NMF 100-9 Classes and Rules. Generally Under Item 116030 (DPE) • Packing Commensurate with Item, Destination and Mode of Transport • Removal of Displaced Equipment is GFE	All Products • Analyze All Aspects of Transportation to Determine If Requirement For Support Equipment Are Created
	• Provide Inputs for Support and Test Equipment Specifications			√	√					
	• Evaluate and Revise Specifications			√	√					
	• Provide Schedule			√	√					
5. MAINTENANCE	• Plan for Maintenance Teams					√		√	• On Site O&M Support Manager Interfacing with Local [redacted] CEs, [redacted] Maintenance Personnel and NPIC Operations Personnel • [redacted] CE's On Call, [redacted] Maintenance Personnel On Site • Computer Diagnostics, Both Automatic and Controlled By Maintenance Personnel, are the Primary Fault Detection/Fault Isolation Device • No BITE or ATE • Maintenance Aids - 'Retain' for [redacted] Commercial Products - Some Self Test Features Planned for the IWS • Preventive Maintenance Not Presently Defined • UNIVAC Equipment and Operational Software are GFE	• Analyze Maintenance On Storage Devices that Cannot Be Removed from the Premises
	• Provisions for Hardware Maintenance	√	√					√		
	• Provisions for Software Maintenance					√	√	√		
	• Use of Computer Diagnostic Routines	√	√							
	• Other Maintenance Aids	√	√		√					
	• Definition of Preventive Maintenance Cycles	√	√							
	• Role/Responsibility of Segment Contractors				√					
	• Role/Responsibility of NPIC Personnel				√			√		

Figure 4.5-1. Elements of the Maintenance and Logistics Plan

SUPPORT & TEST EQUIPMENT (S&TE) -- The S&TE required for the D/C Segment fall into one of three categories: Maintenance and Repair, Integration and Test, and Installation and Handling. All S&TE required for maintenance and repair of [redacted] commercial equipment will be provided under [redacted] prime contract, incorporating terms and conditions of a standard GSA-like maintenance contract. S&TE required for Integration and Test and Installation and handling will be identified and provide from the most economical source. At present, minimal S&TE is anticipated.

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As each requirement for S&TE is identified, an analysis will be performed to define standard commercially available tools and test equipment or operational hardware, modified if necessary, which will satisfy the requirement. Those items that can be provided most economically as GFE will be identified.

TECHNICAL DATA -- The complement of manuals required to support the D/C Segment will consist of existing manuals (modified as required) and new manuals for the developed elements that will mesh with the NPIC system technical data hierarchy. The Operations Manuals (CDRLs 135 and 136) will be developed consistent with the Segment Operations Concept and inputs from the hardware operational requirements and CPCI usage. They will be designed to interface with and complement the NPIC system operations. A study of the best means of providing the operators the required information will be made. This study will evaluate alternatives such as 1) procedures in software for call up by the operator, 2) a pocket guide or quick look manual for infrequently used procedures, or 3) prompting by the system.

The Software Manuals (CDRLS 137 and 138) will describe the programs provided. Programmer Manuals will be generated by the organization developing the CPCI. The Data Base Administrator Manual will be developed by [redacted] Content of these manuals will be written to FIP Standards and will support in depth software training and software maintenance.

STAT

Commercial manuals will be provided for commercial licensed software. Equipment, Operations and Maintenance Manuals (CDRL 148), will be provided for the IWS. Commercial manuals will be provided for the commercial ADPE.

The plan for the generation of manuals will be detailed in the MLP. Validation of the contents of manuals will be performed during the intra and inter segment level tests, hardware and software.

Our present plan is to use two software packages, SCRIPT and CADAM, resident on the Development and Test Laboratory, computer as a cost effective means of manual generation. Schedule for delivery of all Technical Data will be coordinated to support training programs and maintenance (see Figure 4.5-1).

TRANSPORTATION AND HANDLING -- Transportation will be provided using best commercial practices, by air-ride padded van or air freight as the situation demands. Most movements will be by ground transportation for cost effectiveness reasons.

The Shipping Plan (CDRL 147) will be submitted sixty days prior to each shipment of equipment and will define GFE on-site handling requirements for movement and installation of equipment. Special security requirements impacting transportation and handling will be included in the Shipping Plan.

MAINTENANCE -- The maintenance philosophies for both the newly developed IWS equipment and off-the-shelf commercial equipment are similar and will be consistent and compatible throughout the program. [redacted] basic maintenance philosophy for IWS relies on STAT lowest replaceable units (LRU), self test and inherent capabilities, preventive maintenance, with a minimum of corrective maintenance. In the commercial equipment an LRU philosophy is also used, accompanied with extensive reliability, availability and serviceability features in the hardware and software. Extensive error recovery features and built-in maintenance aids are included to make maintenance tasks easier and to reduce the frequency and impact of system interruptions caused by hardware or software failures that necessitate a system reinitialization.

An on-site Operations and Maintenance (O&M) Support Manager will be designated at each site to coordinate hardware and software maintenance and provide a single point of contact for the segment. The O&M Support Manager will be responsible for coordinating maintenance activities of all maintenance personnel with the customer requirements, scheduling preventative maintenance, and assuring an effective maintenance program performance to achieve maximum system availability. [redacted] Customer Engineers STAT are presently servicing equipment at the site and this maintenance team will be expanded as appropriate as the equipment is installed.

[redacted] will provide maintenance teams at both sites commensurate with the level of STAT repair to be performed at each site as determined by the repair level analysis to be performed during this stage.

Maintenance support will be provided 24 hours a day, seven days a week. Computer diagnostic routines will be the primary fault detection/fault isolation device. Located in the [redacted] 3081 process controller is another processor, the Monitoring and System Support Facility (MSSF). This processor and associated microcode is used to control power sequencing/monitoring, error recovery, error data analysis and maintenance procedures. The error data analysis enables the MSSF to automatically define a minimum Field Replaceable Unit (FRU) Group, whenever a hardware error is detected. Validation Tests (VTs) are manually invoked by the CE to verify correct operation after FRU replacement. STAT

The IWS diagnostics will be designed to play a key role in determining the failed replaceable unit when the failure is obviously not a commercial off-the-shelf piece of equipment. In addition, self test features are planned for support of the IWS. As the design of the IWS evolves, these features will be detailed in the maintenance plan. Preventive maintenance on this equipment has been greatly minimized by design. As the preventive maintenance requirements are identified and the maintenance cycles defined, this information will be included in the maintenance plan.

Additional maintenance plans, procedures, and responsibilities are described in the O&M Plan, Section 5.6.

PROJECT PLANS

Approved For Release 2007/09/07 : CIA-RDP84T00037R000400060001-1

Section 5

PROJECT PLANS

5.1 Master Schedule

Our Master Schedule reflects early requirements baselining, extended periods for design, and parallelism in testing. We have found that these schedule characteristics are fundamental to timely, cost-effective large system development.

We began our planning of the D/C Segment Acquisition Phase with the establishment of the major development milestones. Starting with the Key Segment Milestones in the Statement of Work, we derived the interim milestones which satisfy the Program Implementation Directive and support our own development methodology. These milestones, then, became the foundation for all subsequent development planning. Figure 5.1-1 reflects these milestones in the D/C Segment Acquisition Phase Master Schedule.

After establishing the major milestones, the individual development activities were defined and scheduled. Activity schedules for the major development disciplines (e.g., System Engineering, Software) are contained within the subsequent proposal paragraphs which address each of these areas. Detailed activity plans for CDRL items and for individual CPCI development are contained in Appendix B3. The following discussions provide the rationale and/or justification for the primary characteristics of the Master Schedule.

PROJECT MILESTONES AND MAJOR REVIEWS -- The D/C Segment project milestones and reviews which were deemed to be key to the development effort include: 1) Segment Baseline Review (SBR); 2) Preliminary Design Reviews (PDRs); 3) Critical Design Reviews (CDRs); Preliminary Qualification Tests (PQTs); Formal Qualification Tests (FQTs); Factory Acceptance Tests (FATs); and Site Acceptance Tests (SATs).

Our experience in the development of large data processing systems has clearly shown that the establishment of a firm requirements baseline is mandatory in order to achieve a timely, cost-effective development effort. For that reason, we have chosen to conduct a Segment Baseline Review (SBR) 60 days after contract start. We recognize that the other NDS segment acquisition awards follow ours, and that all requirements will not be finalized by our SBR. We still believe, however, that it is critical to: 1) Finalize and agree upon those requirements and interface characteristics which are in place; and 2) To recognize and clearly identify those requirements which are not yet final. For each requirements area which is not complete, a decision will be made at SBR as to whether or not the design process should proceed and to what level. With this approach, we feel that the development effort can proceed in the most expeditious way.

Our development plan reflects a significant portion of the development period being devoted to high-level and detail-level design. We have proven conclusively, through our software engineering practices, that a thorough and carefully reviewed design is fundamental to minimizing latent errors and rework after initial development. Given this, the Master Schedule reflects approximately 50% of the development time being devoted to design.

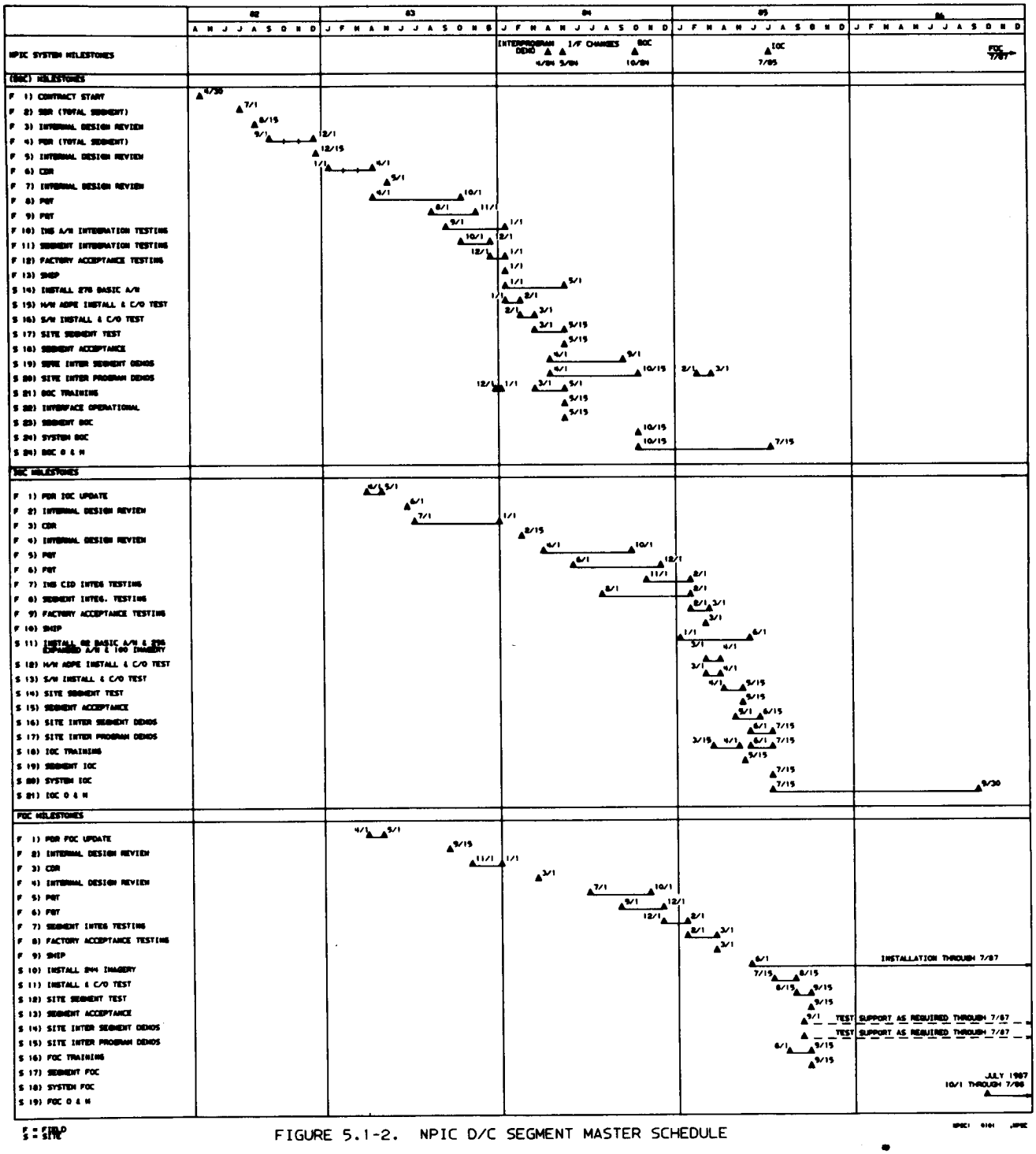

FIGURE 5.1-2. NPIC D/C SEGMENT MASTER SCHEDULE

Figure 5.1-1. NPIC D/C Segment Master Schedule

Our Master Schedule reflects multiple PDRs and CDRs. Our rationale for selecting multiple reviews was two-fold: 1) In large development efforts such as this, it is often a temptation to conduct less than thorough reviews for each CI and CPCI. We have found this approach to be costly in the long run. Multiple reviews allow the appropriate time for complete preparation and thorough conduct; and 2) For large development efforts, efficiency can be gained in resource use by phasing design reviews. Staffing plans can be more reasonably phased, and contention for development computer resources can be minimized. Given this rationale, we have planned phased design reviews.

Qualification tests have been scheduled to provide continuous Government insight into development progress. As independent functional capabilities are available from the phased development effort, PQTs will be conducted and will evolve until the FQT can be performed for each configuration item. The sequence in which the CIs and CPCIs are developed is driven by our top-down development and testing philosophy, and is clearly defined in the individual development plan discussions which follow.

Finally, acceptance tests are planned for each development phase, at both the completion of factory development, and after complete functional and performance testing at the site. Because of the small amount of D/C Segment software function which comprises FOC, we have chosen to complete IOC and FOC factory acceptance at the same time, allowing us to terminate factory operations and reduce development cost. Shortly after the site acceptance of FOC capability, we plan on conducting the final FOC acceptance test.

MAJOR INTERNAL REVIEWS -- Our development plans call for internal reviews throughout the development effort for design, coding, test planning, and various development support activities. The purpose and scheduling of these reviews are discussed within each of the development plans. Those reviews which are of greatest importance, and reflected on the Master Schedule, are the Internal Design Reviews for BOC, IOC, and FOC. These reviews are conducted to verify completeness and readiness for the ensuing PDRs for each phase.

DELIVERABLES -- We have thoroughly assessed the CDRL list and prepared a detailed CDRL Delivery Schedule (See Appendix B3). Each CDRL is included, and we have scheduled the delivery dates for each version, consistent with our Master Schedule and detailed schedules for BOC, IOC, and FOC.

DEVELOPMENT AND TEST LABORATORY SCHEDULE -- Our Development and Test Laboratory (DTL) is a key resource and the availability of specific equipments and capabilities is critical to the successful completion of the development effort. We have performed a comprehensive analysis of all equipment requirements and have formulated a DTL plan that is cost effective while supporting all project equipment requirements. The details of the equipments that will be installed in the DTL along with schedules is provided in Figure 5.1-2. This figure also shows the equipment transition schedule into the site.

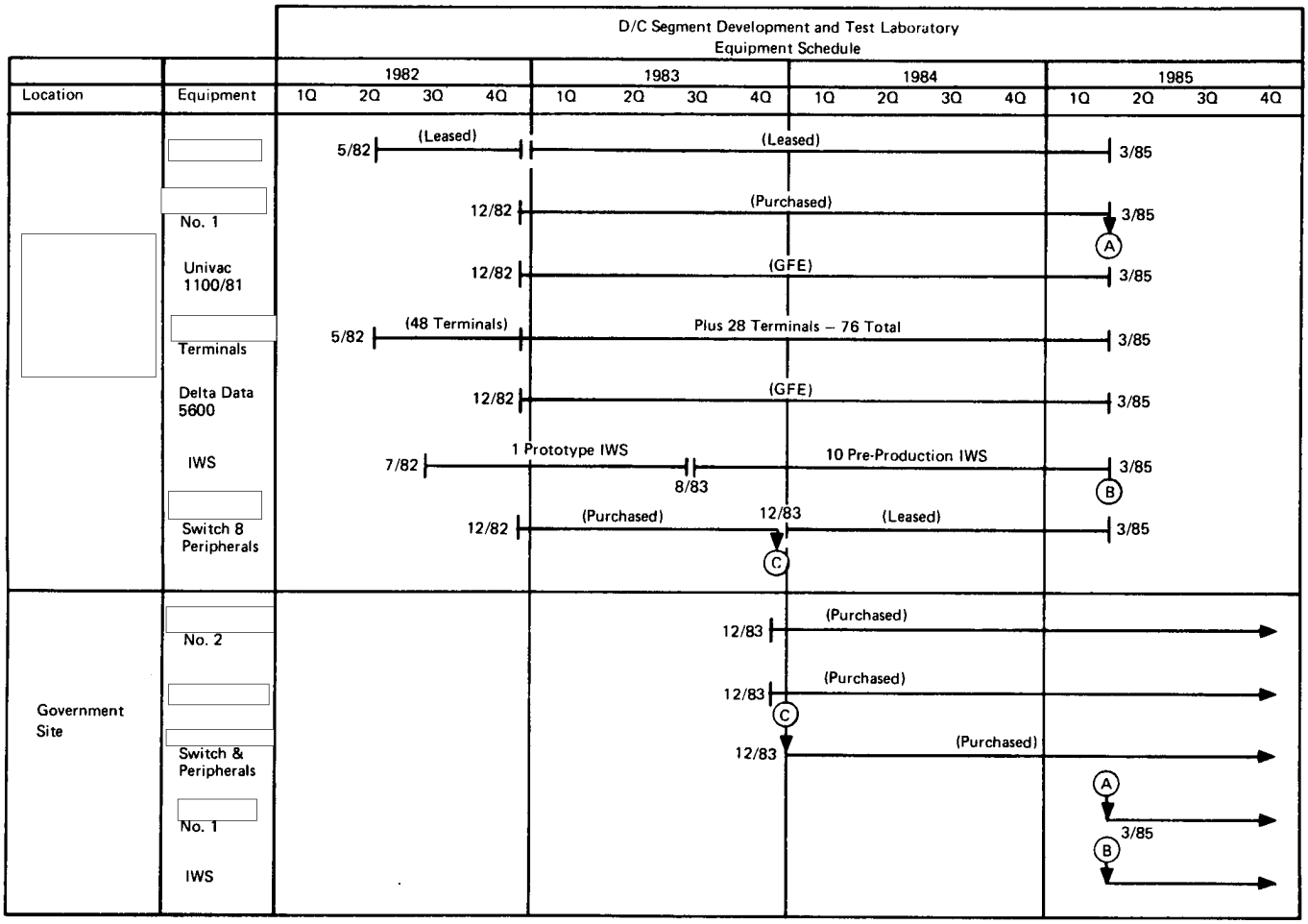

Figure 5.1-2. Development and Test Laboratory Schedule

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5.2 Systems Engineering Management Plan

Our Systems Engineering Management Plan (SEMP) is fully compliant with the SOW, WBS and current PID. A Systems Engineering organization for the D/C Segment has been structured and specific departments have been allocated responsibilities for all SE related SOW tasks and CDRLs.

This Systems Engineering Management Plan section presents an overview of the engineering processes and procedures necessary to meet the NDS development objectives. System requirements defined during the DCP will be translated into an efficient and effective design by the SE Organization. Engineering disciplines and specialities, such as reliability, maintainability, safety, security, training, ILS, cost engineering and human factors are critical considerations that will be factored into the design of the D/C Segment.

The systems engineering organization is responsible for the integration of project activities into a disciplined approach to defining alternatives, analyzing alternatives, performing trade studies and selecting the best alternatives by considering critical parameters, such as performance requirements, intersegment interface requirements, cost and risks.

5.2.1 Organization and Relationship

SE ORGANIZATION PROVIDES TECHNICAL LEADERSHIP THROUGHOUT SAP -- The SE Organization coordinates the definition and design activities of all of the other Project organizations. The Software Development Organization's activities are guided by the products produced by the SE organization. These products include the Part I Specifications, the Preliminary Part II Specifications, the Interface specification and the Data Base Specification. The Integration, Test and Transition Organization activities are guided by the following products created by the SE organization: Segment Test Plan, the Segment Verification Plan and the Segment Transition and Integration Plan. The Training activity is driven by the User Manuals and Operator Manuals and the O&M approach is defined in the O&M Plan and the Maintenance and Logistics Plan.

Among overall project responsibilities, Systems Engineering is responsible for defining and tracking Technical Performance Measurements (TPMs). For each TPM, e.g. Segment Response Time, the SE organization establishes time-phased performance goals. Monthly, SE assesses the current projected performance of the major subsystems that contribute to response time based on the best available analysis or test data. Integrating these individual data points, SE projects the anticipated response time that the segment will achieve on delivery and compares it with the specified level of performance. By systematically tracking TPMs, SE provides the project manager with early indications of any potential deviations from specified performance, so that appropriate corrective actions can be implemented. TPM status reports will be submitted to NDPO, via CDRL 155.

SE ORGANIZATION INTEGRATES ALL ENGINEERING ACTIVITIES -- The SE organization contains four departments, partitioned according to the engineering disciplines of Requirements and analysis, Design, Operations, and Communications and Interface Control. Figure 5.2.1-1 depicts the SE Organization and the allociation of SOW and CDRL responsibilities to each of the departments.

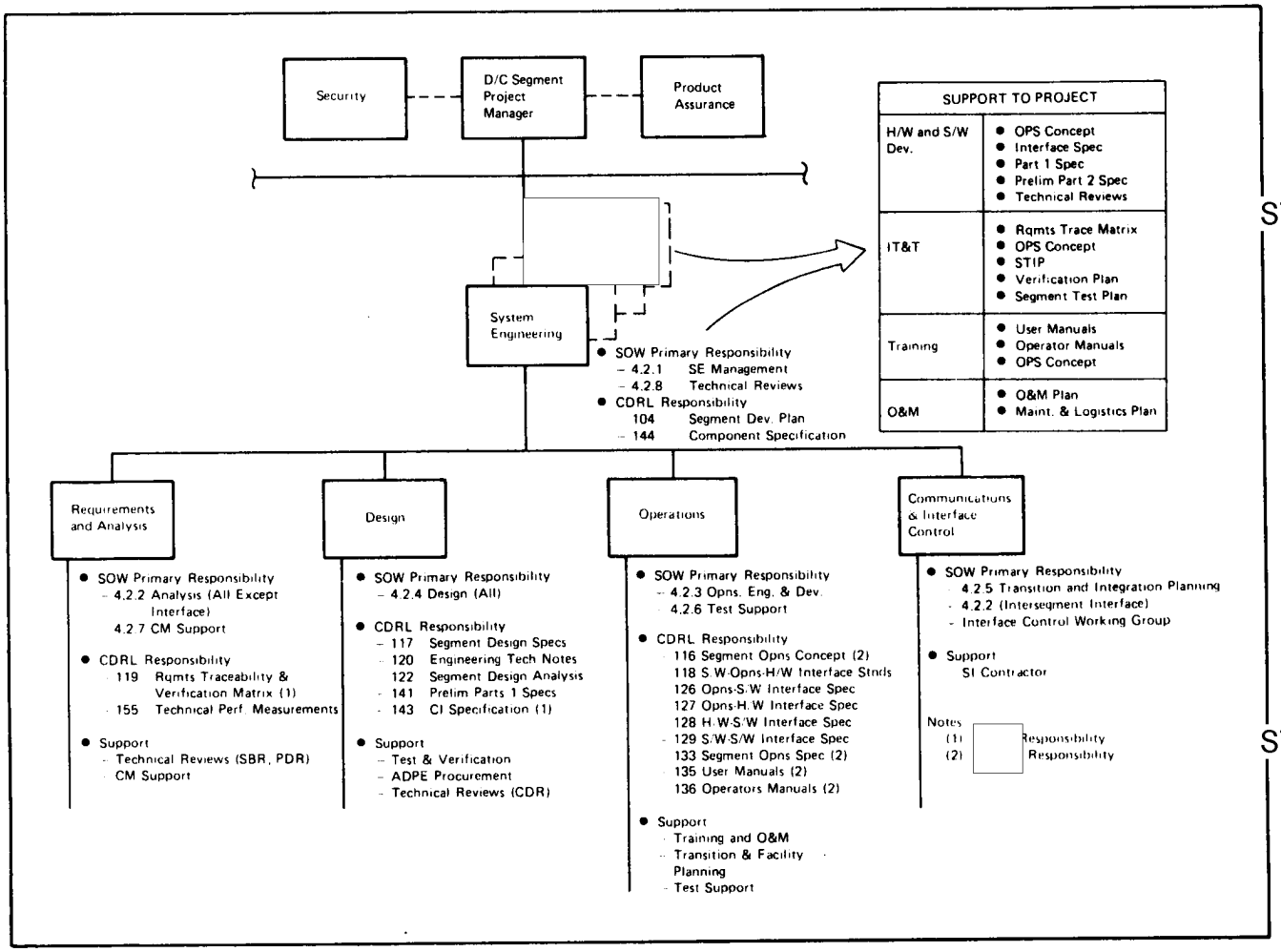

Figure 5.2.1-1. System Engineering Organization and Responsibilities

a. The Requirements and Analysis Department will finalize the D/C Segment requirements and interfaces including intersegment interface definition. This department is responsible for performance analysis and trade studies to identify and track system performance risk and to provide technical measurement of the system performance. Engineers in this Department are experienced in systems analysis and familiar with the NPIC environment, including operational workloads, timelines and constraints. This department is responsible for the D/C Segment Performance model which is used to predict segment performance given different design and environment assumptions. The Requirements and Verification Matrix for the entire D/C segment is also the responsibility of this department.

b. The System Design Department's major activities include refining the allocation of requirements; updating the Preliminary Segment Design and Segment Specification based on customer feedback; development of the CPCI and CI Part I Specifications; providing SBR, PDR and CDR reviews of Segment specifications and supporting all other review and audits; specifying and participating in ADPE procurements; assisting in developing and reviewing of all test plans and procedures and participate in testing; supporting transition planning and transition to the BOC, IOC and FOC systems; supporting CM activities.

c. The Operations Department is responsible for the development of an effective, efficient environment through joint NPIC and [redacted] team participation in studies and experiments; developing segment concepts, procedures and specifications working with the other successful segment contractors through the Interface Control Working Group; developing user and operation manuals; and reviewing training plans and materials. This department is staffed with personnel familiar with NPIC operations (both the Imagery Analyst and computer operators), with human factors analysis and design, and with facilities planning. This department will oversee the development of the Segment Operations Concept and specification, User Manuals, Training Plan and Facility Requirements Drawings. Each of the subcontractors contribute to the Users Manuals and the Operator Manuals for the CPCI's for which they are responsible. STAT

d. The Interface Control Department is responsible for intersegment interface definition and requirements. They participate in the Interface Control Working Groups and provide and enforce software-operations-hardware interface standards. Personnel in this department are experienced in communications, hardware and data base interface protocols.

SUBCONTRACTOR SUPPORT TO SYSTEMS ENGINEERING ORGANIZATION -- While [redacted] retains overall responsibility for system engineering, each of the subcontractors will perform the system engineering task relevant to the CPCI's for which they are responsible. Control is exercised by developing detailed, composite Segment Development Plans and integrating each of the team member's individual plans. Weekly reviews of progress on the Plan will be held, variances identified and corrective actions assigned. STAT

In addition to providing systems engineering support for their assigned CPCIs, the team members have been delegated the following areas of System Engineering responsibilities:

a. [redacted] develops and maintains the D/C Segment performance model to validate the full system, provides the Requirement Traceability and Verification Matrix. STAT

b. [redacted] provides Segment Operations Concept and Specifications, User Manuals, Operator Manuals, Training Plan and Facility Requirements Drawings. STAT

c. [redacted] will produce the CI Specification for the IWS and provide system engineering support to develop the IWS and the associated CPCIs. STAT

The SE organization represents the D/C Segment development in other technical forums. These include:

a. Segment SBR, PDR's and CDR's;
b. Interface Control Working Groups;
c. System Readiness Review Board;
d. Project Configuration Control Board (PCCB);
e. [redacted] Segment Configuration Control Board (SCCB); and STAT
f. Subcontractor Control Board (SCB).

Section 4.4 describes in detail how each of the Configuration Control Boards function.

5.2.2 Methodology

Systems Engineering employs a proven and disciplined methodology to analyze requirements, structure alternatives and specify a segment design for implementation by the Segment Development organization.

SE METHODOLOGY OVERVIEW -- The SE Methodology is initiated by the baseline design as derived from the DCP. The process considers and accommodates each driving requirement, i.e. operational, functional, performance, reliability, maintainability, availability, security, interface and anticipated growth. The D/C Segment Design Specification is produced based on a detailed analytical assessment of requirements, operational concepts and guidance from the government at SBR, PDR and CDR.

Hardware and software architectural alternatives identify potential advantages in performance, cost savings or risk reduction. Through systems analysis and trade studies, the segment design is finalized for the Integrated Work Station and each of the seventeen Computer Program Configuration Items. Specialty Engineering disciplines such as human engineering, reliability, logistics, training, safety and cost engineering are utilized throughout the process by the systems engineering organization to assure the completeness and integrity of the segment design.

The major role of Systems Engineering during this critical design and review process is leadership and coordination in analyzing requirements, structuring alternatives, performing trade studies, producing specifications and active participation in conferences, meetings and working groups to resolve action items. Figure 5.2.2-1 provides an overview of the steps involved in the Systems Engineering process for the D/C Segment.

TOOLS SUPPORT THE SE PROCESS--The SE Methodology is supported by the use of a set of proven tools such as PSL/PSA, D/C Segment Pilot Model, D/C Segment Performance Model and discrete Simulation.

a. Problem Statement Language/Problem Statement Analysis -- The SE Organization is currently utilizing PSL to develop two data bases. The first will contain NDS requirements, and the second, the capabilities in the Segment Design Specification. The objective of this PSL/PSA activity is to logically connect all identified requirements with the associated portions of the design specification which fulfills each requirement. Upon completion and baselining of these data bases, the SE organization will utilize the report generation capability of PSA to output results of mapping requirements against specification to highlight and rectify inconsistencies. Emphasis is placed on generating and maintaining requirements traceability and verification matrices, and in supporting computer generated CPCI specification (Parts I and II). SCRIPT and CADAM are used for ease in configuration management compliance and general on-line text maintenance.

b. D/C Segment Pilot Model -- A Pilot Model of the D/C Segment has been developed to test and demonstrate segment features. This model is fully described in Appendix A-5 of Volume II of the Technical Proposal. The Pilot is used to develop and interface a test data base; to test an interface between the host processor and the front-end processor; to test an interface to a Local Area Network (LAN); and to analyze human interfaces through simulated IA scenarios.

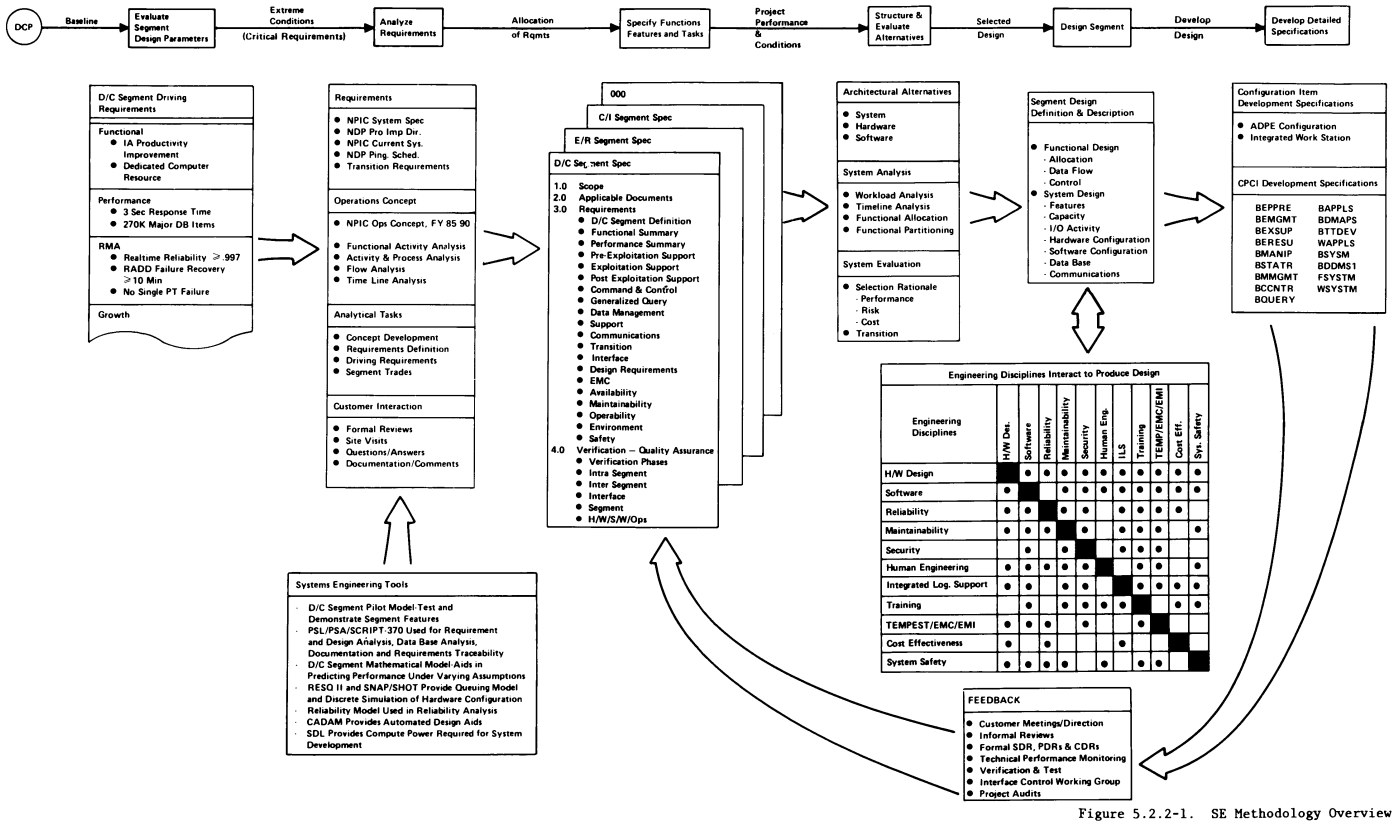

Figure 5.2.2-1. SE Methodology Overview

c. D/C Segment Performance Model -- A mathematical model of the D/C Segment has been developed to allow the system engineers to predict the performance of the segment under a variety of design, loading, and environmental assumptions. This technique reduces the risk that a change in the design or in the projected segment workload will have unanticipated effects on segment performance. This model is also used to study the impacts on the D/C Segment by the other segments as their designs and requiremnets become known.

d. Discrete Simulation Model -- Performance characteristics of discrete [redacted] STAT hardware and software products is structured in a model that is currently in use by the Systems Engineering Organization. This model, called SNAP/SHOT, allows an engineer to combine [redacted] STAT products, such as processors, operating systems, storage devices and front-end processors with customer unique configurations and design assumptions to provide an accurate prediction of system performance. This model will also be used in studies to compare performance levels of various configurations.

STUDIES AND TRADES IDENTIFIED -- The Systems Engineering organization will be responsible for continual support of the project in studies and trades throughout the SAP time period. Figure 5.2.2-2 presents an overview of the procedures used by the SE Organization to perform a trade study. While the DCP did evaluate and resolve a significant number of alternatives, a number of additional key studies and trades have been identified for resolution in the early stages of the SAP:

a. Human Factors Work Station Design Trade -- The human factors implications of IWS design alternatives will be evaluated with the objective of trading off user friendliness and attendant productivity improvements vs. cost. Also we will participate with the Government in planned experiments with the IWS in areas of productivity enhancements and human factors engineering.

b. Performance Model Refinement Study -- The simulation model of our hardware/software configuration will be updated with actual design data and results of testing activities in our Development and Test Laboratory.

c. Communications Interfaces Study -- The protocols (Levels 1, 2 and 3) will be defined to establish the physical and logical interfaces between segments. The applicability of available X.25 products and procedures will be explored.

d. Processor and DASDI Design Trades -- Alternatives in processor size, speed and configuration will be identified and evaluated in terms of cost, level of support and responsiveness to the NDS D/C Segment application. Similarly, disk storage alternatives will also be analyzed prior to ADPE procurement decisions.

e. IWS Capability Trade -- Fiscal funding limitations may require the deployment of a reduced capability for the IWS at IOC and a field upgrade at FOC. The implications of this change will be analyzed in terms of operations, costs and risks.

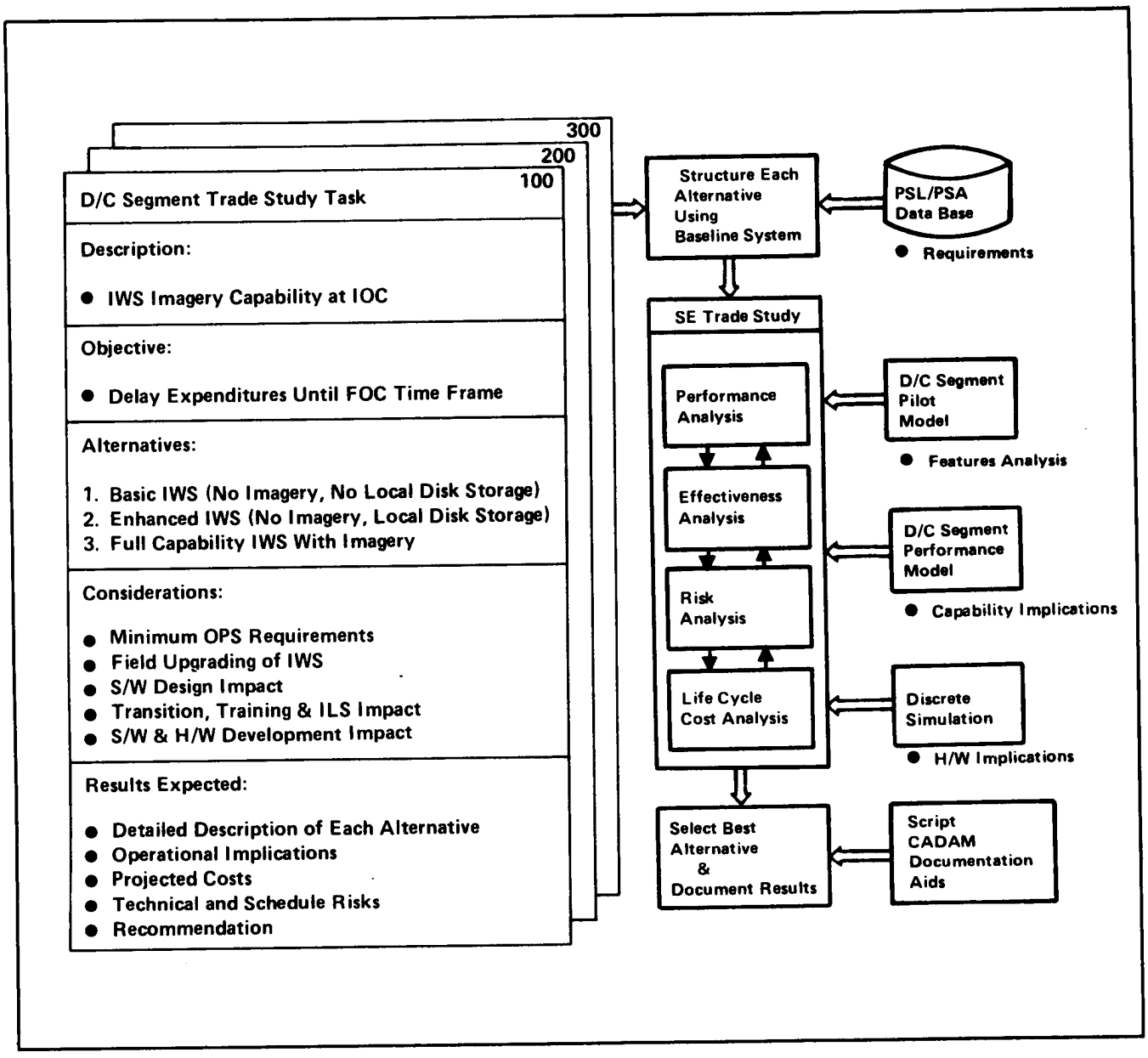

Figure 5.2.2-2. Example of Trade Study Methodology

5.2.3 Activity Plan

The SE Activity Plan is designed to provide all necessary support to the project in a timely manner. Our objective in structuring this schedule is to meet all project milestones for BOC, IOC and FOC.

SE ACTIVITIES AND OBJECTIVES -- Each of the four organizations comprising the SE organization (i.e. Requirements Analysis, Design, Operations, and Communications and Interface Control) have been designated specific objectives and activities required to achieve these objectives. Figure 5.2.3-1 delineates the key activities planned for the SE organization during SAP.

The Systems Engineering (SE) Organization's activities will have four phases for special emphasis during the SAP time frame. First, there is a requirements allocation stage in which the emphasis will be on refining requirements, allocation of requirements to segment CI/CPCI's and creating conceptual designs. In the second phase, the focus will be on segment definition and specifications as reflected in the Segment Design Specification, Segment Operations Concept, refining the verification process, and transition planning. The third phase, is critical design and the activity will include developing detailed Part I and Part II Specifications, the Data Base Specification, and Interface Specifications. This third phase also includes hardware-software integration and support to the project test organization to ensure that the requirements are indeed satisfied by the developed products. Finally, the fourth phase will concentrate on verification of the segment's operational performance by assisting the SI in a variety of inter-segment and system/segment tests and operational demonstrations.

SE ACTIVITY SCHEDULE -- Each SE task defined in the WBS and the SOW has been allocated and scheduled for consistency with the master schedule. Figure 5.2.3-2 shows the schedule plans for each SE task required in BOC, IOC and FOC. Also shown are those CDRL's associated with key activities.

SE Organization	SE Responsibilities and Objectives	Key SE Activities
REQUIREMENTS AND ANALYSIS	• D/C Segment requirements and interfaces • Formal, comprehensive and structured requirements analyses • Requirements consistency, clarity, testability, feasibility • Predict system performance • System performance risk identification • Technical measurements of system performance • Configuration RMA tracking • Document significant trades affecting D/C segment • Logical trace between requirements and design • Verification of requirements	• Continue to expand PSL/PSA data base and analysis to validate requirements and to provide requirements traceability • Maintain PSL/PSA data base throughout SAP • Use SNAPSHOT, and System loading models to estimate system performance • Add fidelity to models in all performance/risk areas to reflect actual design parameters and test data • Use standard tools, special software and models to track technical performance • Develop RMA analysis updates based on configuration updates • Develop segment design analysis report • Work across program organization to identify and perform significant trades • Use PSL/PSA to provide requirements traceability and verification
DESIGN	• Segment Design that Meets all requirements • Requirements allocated to hardware/software/procedures • Segment test, evaluation, integration and transition	• Update preliminary segment design based on government feedback and updated segment specification • Perform design trades, reviews and audits to support design decisions • Perform requirements allocation and develop CPCI Part I and CI specifications • Participate CM activities by performing change impact analysis • Support Test Planning and the execution and evaluation of tests • Support Transition Planning and segment transition into the operational environment • Provide SBR, PDR, and CDR Review for Segment Specifications • Support ADPE procurement activities
OPERATIONS	• IWS User interface requirements in conjunction with NPIC user personnel • Develop a segment operations concept consistent with NPIC system • Operations Concept features including future requirements	• Participate in Studies and Experiments with NPIC users. • Analyze Human Factor Interface Requirements and Implications • Interact with other Segment Contractors for a total system perspective • Prepare appropriate user and operators manuals
COMMUNICATIONS AND INTERFACE CONTROL	• Achieve cost effective communications interface across NPIC • Intersegment interface definition consistent with operations concept • Controlled interface design • Assurance with appropriate standards and interfaces	• Participate in development of comm. Protocol standards • Design intersegment interfaces • Participate in interface coordination activities with NDPO and SI contractor

Figure 5.2.3-1. SE Activity Summary

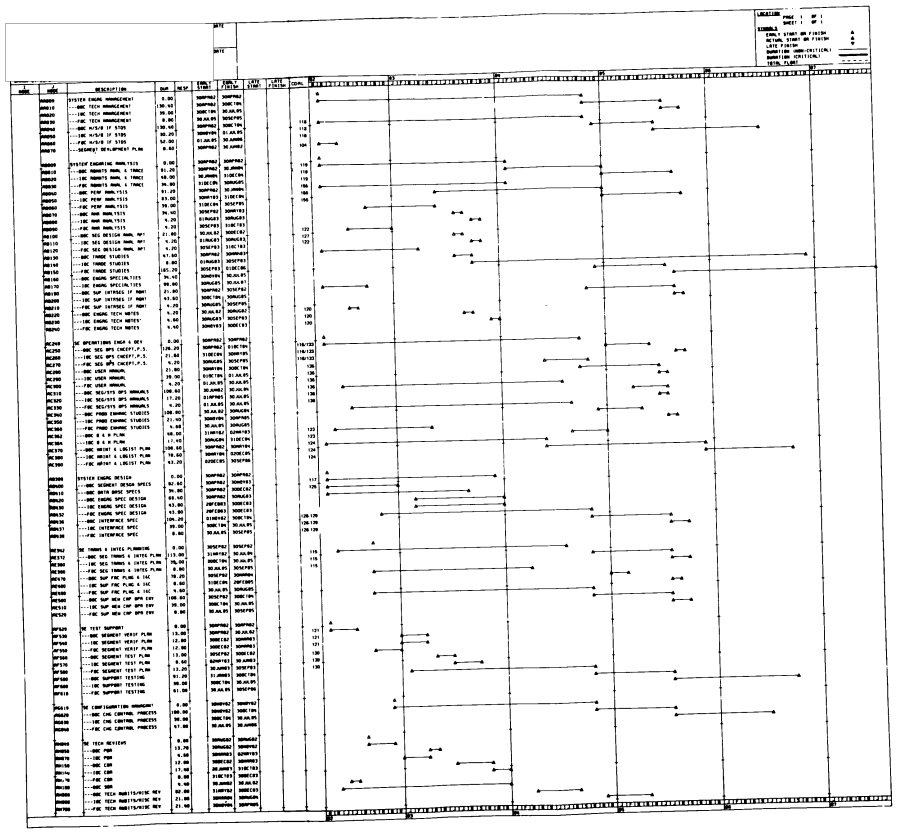

Figure 5.2.3-2. SE Activity Schedule

5.3 Software Development Plan

Software Development is critical to the entire D/C Segment Project's adherence to Schedules and Milestones. Therefore, this Software Development Plan emphasizes schedule commitment and applies proven programming technology to increase programmer productivity while maintaining the highest standards for quality.

This section presents an overview of the Software (S/W) Development Plan (SDP). The major features of this plan that will contribute to timely completion of quality software are:

a. EXISTING CODE AUDIT -- We have performed a comprehensive analysis of the existing code and we intend to salvage and exploit the existing code whenever possible.

b. CONSOLIDATED S/W DEVELOPMENT -- all D/C Segment software will be developed, integrated and factory tested at our Gaithersburg facility.

c. DEVELOP AND TEST LABORATORY -- all hardware required for system development, integration and factory acceptance testing will be contained within our laboratory in Gaithersburg.

d. PARALLEL S/W DEVELOPMENT -- CPCI's have been logically grouped to allow for parallel development and to expedite the development schedule.

e. COMMERCIAL S/W PRODUCTS -- Standard Commercial Products are used whenever possible to reduce the amount of new code required.

f. [redacted] ENGINEERING PRACTICES -- Standard engineering and programming practices used on all [redacted] projects will be applied to this project. STAT STAT

g. PROBLEM ANALYSIS AND ERROR DETECTION -- is monitored through a hierarchy of source code and stringent configuration management.

h. ACTIVITY SCHEDULE -- each CPCI is planned in detail through its design, code and test stages.

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5.3.1 S/W Organization and Responsibilities

The S/W Development Organization is clearly defined and the responsibilities for SOW tasks and CDRLs have been assigned to specific departments within this organization.

SOFTWARE DEVELOPMENT ORGANIZATION -- The D/C Segment Software Development organization is defined to facilitate the parallel development of multiple CPCIs while maintaining technical and product control. The Software Development organization is shown in Figure 5.3.1-1 along with the assignment of responsibilities and deliverables that are consistent with the WBS and SOW.

Three departments report to the S/W Development manager. The S/W Engineering Group is primarily responsible for defining the software architecture, system design, data base conversion and general support to all S/W development. The Software Control Group is primarily responsible for the control of S/W library, S/W builds and releases. This group will also be responsible for the COBOL conversion of the existing code to the new processor configuration. The CPCI Development Group will consist of multiple departments with specific CPCI responsibilities. These responsibilities include design, code, unit test, S/W integration and problem evaluation and correction.

[ ] is assigned responsibility for one CPCI, Pre-Expoitation, consisting of 128K source lines of code, (SLOC). [ ] is assigned the responsibility for two CPCI's, Data Manipulation and Test and Training Support, consisting of 134K SLOC. Two CPCI's associated with the Integrated Work Station, the Station System/Control Software and the Station Application Software, 176K SLOC, are assigned to [ ] is responsible for the remaining twelve CPCI's consisting of 303K SLOC. STAT STAT STAT

These subcontractors will perform CPCI design and development under the technical direction and guidance of the Software Engineering Group to assure that all CPCIs are developed using identical practices, conventions and procedures.

JUSTIFICATION OF ORGANIZATION -- The organizational structure defined in this plan is patterned after [ ] S/W organizations successfully used for other large development efforts such as DSM, GPS, Space Shuttle and the Launch Processing System. The structure provides for specific CPCI responsibility that is guided by an overall architecture design developed by the S/W engineering group and supported by the S/W Control Group in library maintenance and configuration control. While the subcontractors are controlled by the Subcontractor Acquisition manager from a business viewpoint, the S/W Engineering Group provides the subcontractors with all required technical guidance. Functional allocation of responsibilities, the requirement for parallel development of CPCIs and span of control were the primary considerations in structuring this organization. STAT

RELATIONSHIP TO OTHER ORGANIZATIONS -- The S/W Development organization receives requirements and Part 1 specifications from the Systems Engineering Group. Once CPCIs are unit tested they are integrated and tested by the Intergration, Test and Verification Group. The S/W Development organization supports configuration management control provided by the Project Control Office.

Software Quality Assurance is performed in the Product Assurance organization independent of the D/C Segment Software Development organization. The role of SQA is to monitor the work process and review the work product in the context of the Software Development Plan. Reports on adherence to or variation from the published methodologies, procedures and end product descriptions will be made to the Software Development Manager, and if necessary, the Program Manager.

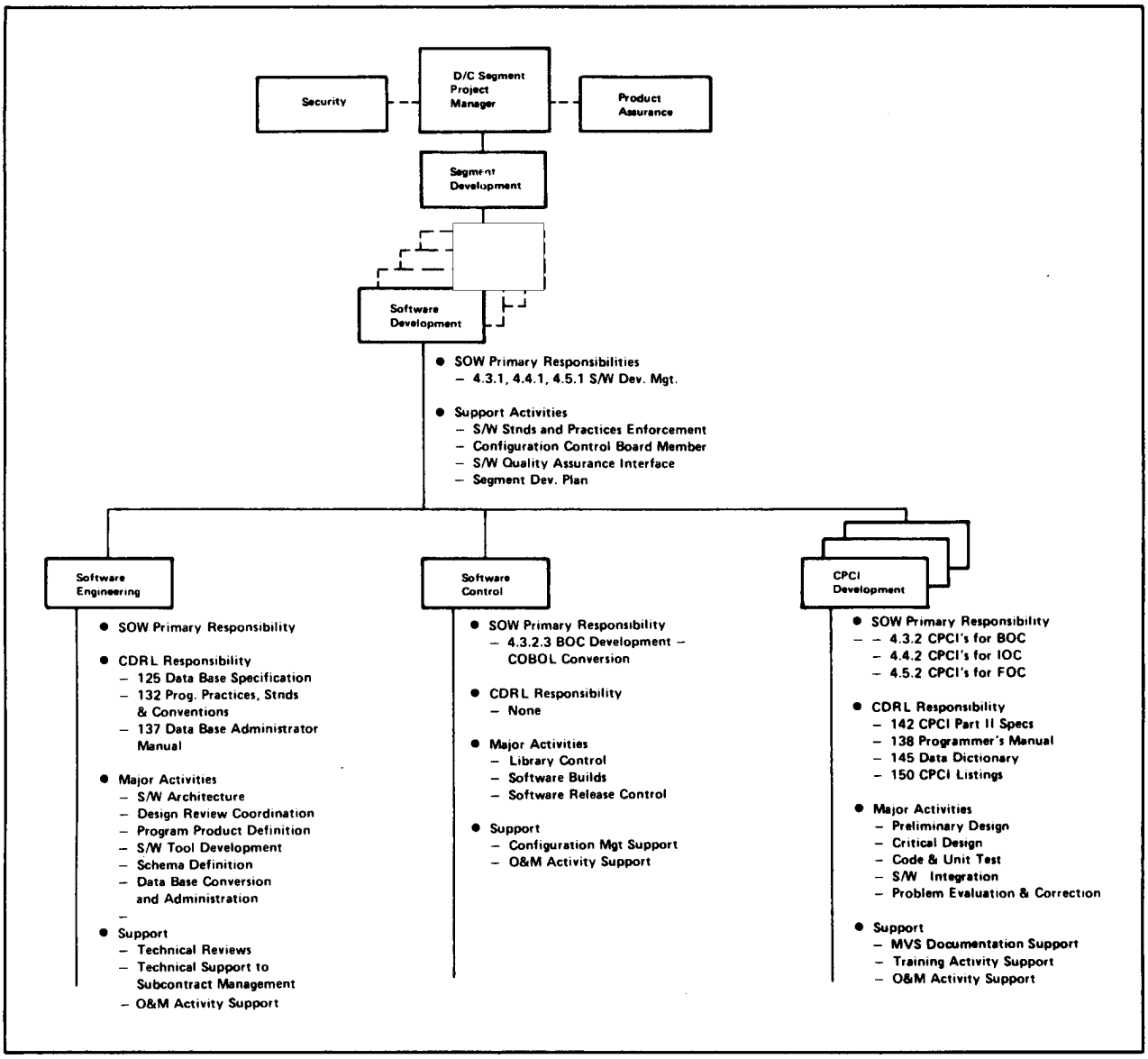

Figure 5.3.1-1. S/W Development Organization and Responsibilities

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5.3.2 S/W Products Control and Methodology

Our S/W development methodology has proven to be efficient and effective on other large, complex S/W development contracts and will be used on the D/C Segment to maximize productivity and minimize risk.

D/C SEGMENT SOFTWARE PRODUCTS -- The products of software development (namely, the design documentation, the source code and the as-built documentation) will be built via terminals using the Development and Test Laboratory Facility.

Figure 5.3.2-1 indicates the products which emerge from the phases of the software development process. In general, the System Engineering Organization is responsible for the products developed through PDR, with support and input from the Software Development Organization. After PDR, the product responsibility shifts to the Software Development Organization. During critical design, control is provided by the Part I Specifications and project standards. The product of critical design, Part II Specifications and supplementary documents, are baselined at the CDR milestone. This total set of specifications then controls the source code generation, test, and integration activities. The establishment of design documentation baselines occurs through the formal review process; control of the source code during development is maintained via internal design reviews, code inspection, SQA reviews and S/W testing. Baselining of the source code and as-built documentation occurs upon successful formal testing (PQT, FQT and acceptance).

The products of software development, both documentation and source code, will be produced based on guidelines from this S/W Development Plan and the specific directions in the Programming Practices, Standards and Conventions (PPS&C) document.

S/W DEVELOPMENT PROCESS -- COBOL source code for the D/C Segment will be developed based on a design expressed in Program Design Language (PDL) and according to the implementation directives of the PPS&C. This guidance applies to both technique and style. Adherence of the directives of the PPS&C is mandatory and assures consistency in implementation technique and presentation, thus maximizing the maintainability of the software. Three formal inspections will be performed at two design levels and the actual code level.

Significant emphasis is placed on the configuration management of the software products because of the magnitude of the products, the number of development teams engaged in parallel development of CPCIs, and the need for multiple version (BOC, IOC, FOC) support. Section 4.4 provides a detailed description of the Project Configuration Management structure and methodology.

Our software tools satisfy the stringent configuration management requirements through a hierarchical library structure for both source code and documentation. Access control is provided at each level of the hierarchy. Source code will reside in a hierarchy of at least four levels, where the differentiation of level is by the person/organization having change authority as follows:

a. Level 1: Controller is CPCI Development Manager. A sub-library hierarchical structure will exist for each CPCI as deemed necessary and controlled by that CPCI's development manager. All development activities leading up to PQT will be supported at Level 1.
b. Level 2: Controller is Test and Verification Manager via contractor CCB. Qualification testing (PQT and FQT) activities will be supported at Level 2.
c. Level 3: Controller is D/C Segment Project Manager via the Project Configuration Control Board (PCCB). Acceptance testing activities will be supported at level 3.
d. Level 4: Controller is Customer CCB. This is the release level library which will contain the operational software.

The movement of source code upward from Level 1 in the hierarchy is through a process of "offer" and "promote/reject". The controller at a given level can "offer" software when specified exit criteria are met; the controller at the next level can "promote" the offered software if satisfied that all criteria are met, or otherwise "reject" it. When a failure is found through test or operation at Levels 2 through 4, a Program Test Report (PTR) is written for consideration by the appropriate CCB. Correction of software defects are performed at Level 1 after the erroneous source has been copied from the higher level library to Level 1 library.

Sections 4.3 and 4.4 describe in detail the application of quality assurance and Configuration Management to documentation. However, to summarize, Documentation will reside in a library hierarchy of two levels. The lower level is subsetted by the CPCI development manager. The higher level contains the baselined documentation and as such is controlled by the D/C Segment Program Manager via the contractor CCB.

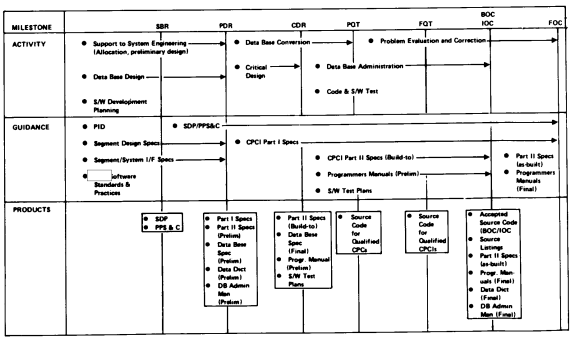

Figure 5.3.2-1. The Emerging Products of Software Development

Training for all segment users, operators and maintenance personnel will be provided prior to segment deliveries. Details and schedules for the complete training program may be found in Section 5.7.

Cost control over S/W development is based on the concepts of baselining and status tracking. All interim work products (plans, designs, source language, etc.) are put under baseline control. Changes to baselines are subject to our design-to-cost practice. Baselines are visible to the management team and are the subjects of status tracking. Status tracking extends beyond the practice of reporting actual achievements against the baseline plans in two ways. First, the practices of technical reviews and formal inspections focus on early error detection. Through this technical status tracking of the emerging work product, problems are found early in the development process when solutions are most cost-effective. Our experience indicates that 75% of all software errors can be identified and corrected through the review and inspection processes before any actual test of the software begins. Second, work in progress information provides productivity rates that are applied to estimates-to-complete.

Figure 5.3.2-2 contains a summary of [redacted] S/W standards and practices and their relation to the D/C Segment major milestones. STAT

[redacted] STANDARDS & PRACTICES	ACTIVITIES LEADING TO D/C SEGMENT MILESTONES: High Level Design	Detailed Design	Coding Unit Test Integration	Segment Testing
Modular Design	X	X		X
Data Design	X	X		X
Logical Expression	X	X		X
ADA-Based PDL	X	X		X
Design Methodology	X	X		X
Design Verification	X	X		X
Coding Conventions			X	X
Development Environment			X	X
Top-Down Implementation			X	X
Simulation Software		X	X	X
Incremental Development		X	X	X
Interface Specification	X	X		X
Integration Methodology			X	X
Software Development Plan	X	X	X	X
Design-To-Cost/Cost Mgmt	X	X	X	X
Technical Reviews	X	X	X	
Formal Inspections	X	X		

STAT STAT

Figure 5.3.2-2. [redacted]/W Standards and Practices STAT

STRUCTURED PROGRAMMING FACILITY USED IN THE IBM TEST AND DEVELOPMENT LABORATORY [redacted] STAT

Structured Programming Facility (SPF) will be used by the Software Development Organization. The SPF provides a capability, called the Standard Terminal Interface (STI), which allows programmers to have functional access to an integrated set of programming tools via a programmer terminal without requiring knowledge of the programmer's part of the specific characteristics of each tool. This programmer's "Tool Kit" provides such function as program compilation, file services, e.g., copy, compress, delete, etc., syntax, analyzers, traces, source code entry, source code editing, change accounting, and version discrimination. Under development is an additional feature to support definition and creation of data files to support testing and file conversions. This "Tool Kit" is being successfully employed on other large [redacted] programs. STAT

METHODOLOGY EXPLOITS EXISTING SOFTWARE -- The code audit performed during the Design Competition Phase has enabled the [redacted] team to accurately estimate the size of required software and identify significant savings in code development by retaining existing system/applications software during BOC and converting existing applications software during IOC. The estimated sizes of each CPCI along with projections of the source lines of code that will be retained, modified or newly created is found in Figure 5.3.2-3. STAT

As a schedule risk reduction action, the [redacted] team will continue to emphasize the exploitation of the existing software base. Wherever possible, existing software will be retained, converted or used as a model, as appropriate. Our choice of COBOL as the implementation language was heavily influenced by our recognition of the value of the existing software. STAT

The proposed software architecture relies heavily on commercially available software products. This includes the operating systems for each of the processors, the communications access methods, the network control, the transaction monitor and the data base management system. In addition to the foregoing items which are usually architected into a system, the [redacted] team has specified the use of the program products for specific application use, such as the text edit and spelling verification functions. We are proposing the adoption of the X.25 Communication Standard for the local area network (LAN) interface, which will be implemented using commercial [redacted] software products. STAT STAT

ESTIMATED SIZES OF CPCI'S IN SOURCE LINES OF CODE X1000

CPCI	IBM TEAM RESP	BOC UNIVAC R	BOC UNIVAC M	BOC UNIVAC N	BOC NEW HOST C	BOC NEW HOST N	BOC WS N	BOC FE N	IOC NEW HOST R	IOC NEW HOST C	IOC NEW HOST M	IOC NEW HOST N	IOC WS R	IOC WS M	IOC WS N	IOC FE R	FOC NEW HOST R	FOC NEW HOST C	FOC NEW HOST M	FOC NEW HOST N	FOC WS R	FOC FE R	FOC TOTAL
PRE-EXPLOITATION	SDM	5	4	2	23	97			120	7		1					128						128
EXPLOITATION MGT	IBM	26	3	34		30			30	32		14					76						76
EXPLOITATION SPT	IBM	133	16	15						2		48					50						50
EXPLOITATION RESULTS	IBM	21	3	4						21							21						21
DATA MANIPULATION	SA&H	88	10	11						80		6					80						86
STATISTICS REPORTING	IBM	23	1	6						18		2					20						20
MATERIALS MGMT	IBM	15								8		1					9		7				16
COMMAND & CONTROL	IBM					4			4			20					24		12				36
QUERY SUPPORT	IBM	40	3							23		16					39						39
HOST SYSTEM SW	IBM	*				*			*								*						*
HOST APPLICATION SPT	IBM	51	4	13		5			0	29							29						29
DBMS	IBM	*				*			*								*						*
DBM APPL SPT	IBM			3		8			8			8					16						16
TEST & TRAINING SPT	SA&H	6		5		30			30	5		8					43		5				48
WS SYSTEM SW	SDC						*						*							*	*		*
WS APPLICATION SPT	SDC						35						35		141					176			176
FE SYSTEM SW	IBM							*								*						*	
TOTAL		408	44	93	23	174	35		192	225	12	124	36		141		541		24	176			741

*SYSTEM SW IS COMMERCIALLY AVAILABLE

LEGEND

R – Retained Code N New Code
M – Modified Code C Converted Code

Figure 5.3.2-3. CPCI Source Line Estimates

5.3.3 Activity Plan

On-time delivery of the D/C Segment Software will be accomplished through parallel development paths, maximum retention and/or conversion of existing software, and maximum use of commercial software products.

Because of the stringent BOC schedules imposed by external factors on the NDS D/C Segment, the [redacted] team has developed a three-pronged strategy to expedite the schedule. STAT First, the software architecture is defined to facilitate parallel development by minimizing interfaces between CPCIs. Second, maximum utilization of the existing software will be made to reduce the development effort. Third, existing commercial software products will be utilized wherever possible to minimize the integration effort.

RISK CONTAINED BY STRATEGY PLAN -- Three areas of risk have been identified: schedule, quality and cost. Our plan minimizes these risk areas by assuring that we will meet our schedule objectives for BOC, IOC and FOC without compromise of software quality or unnecessary cost. Figure 5.3.3-1 identifies the major factors that will guide our S/W development activity in order to reduce risk.

S/W DEVELOPMENT SCHEDULE CONSISTENT WITH PROJECT MILESTONES -- Functional allocation based on our architectural design has resulted in the definition of seventeen CPCIs. Eleven of the CPCIs are strictly applications software; these have minimal direct interfaces among themselves. As a result they can be developed in parallel with minimal risk. Four of the CPCIs represent the system level software; these are implemented with commercially available software products. The remaining two CPCIs provide the bridges between the application CPCIs and the systems CPCIs.

The schedule for software development is fully compliant with the dates imposed by the RFP. Figure 5.3.3-2 presents an overview of the S/W Development Schedules. The individual activity plans and schedules can be found in Appendix B-3.

Risk Area	Containment Strategy
Schedule	• Architecture Minimized CPCI Interface Requirements • Maximum Exploitation of Existing Code • CPCI Parallel Development Paths • Maximum Use of Standard Program Products • High Programmer Productivity • Tight Subcontractor Controls • Consolidated S/W Development in Gaithersburg Dev and Test Lab • Incremental CPCI/CPC Integration & Testing
Quality	• Centralized S/W Architectural Control • S/W Quality Assurance Procedures • Proven S/W Engineering Technology • Detailed Standards and Conventions Enforced • Detailed Reviews and Inspections • Proven Common Tools and S/W Library • Independent CPCI/CPC Testing and Validation
Cost	• Tight Management Cost Control at CPCI Level • [redacted] S/W Technology and Tools Enhance Programmer Productivity • Maximum Exploitation of Existing Code • Maximum Use of Standard Program Products

STAT

Figure 5.3.3-1. S/W Risk Containment

A detailed CPCI development schedule is found in Figure 5.3.3-3. The assignments are based on the organization's capability to technically address the CPCIs and the overall meshing of milestones to minimize schedule risk. Technical control over this activity is provided by the centralized [redacted] software engineering function and is possible because of the extent of independence among the CPCIs. STAT

a. Design - Software Development documentation is prepared attendant to PDR and the critical design is completed leading to CDR.
b. Code, Test and Integration - Upon design approval, module coding and testing occurs, followed by integration through the CPC level.
c. Preliminary Qualification Test - Integrated CPCs are promoted incrementally for independent test and preliminary qualification.
d. Problem Analysis and Error Correction - Upon successful PQT, a CPC is placed under configuration management. Reported discrepancies are evaluated and errors corrected under the auspices of a CCB. Until formal acceptance of the software, the [redacted] CCB holds change authority, thereafter the Government CCB takes responsibility. STAT

PDRs and CDRs are planned within the time frames indicated and will be scheduled by application-related CPCIs. The reviews are planned to take advantage of the overlapping schedules of the four members of the [redacted] team. STAT

STAT

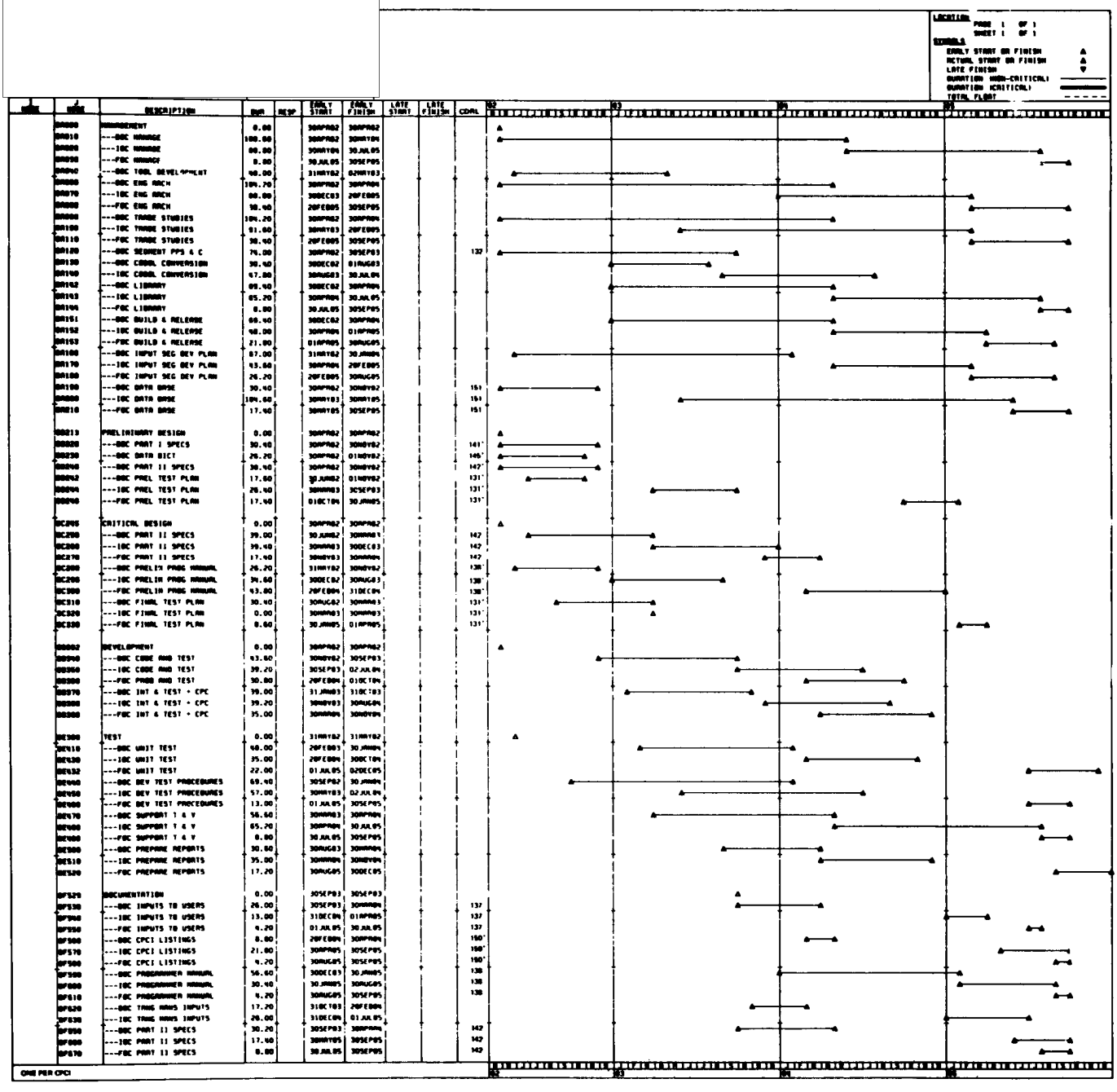

Figure 5.3.3-2. Software Activity Schedule

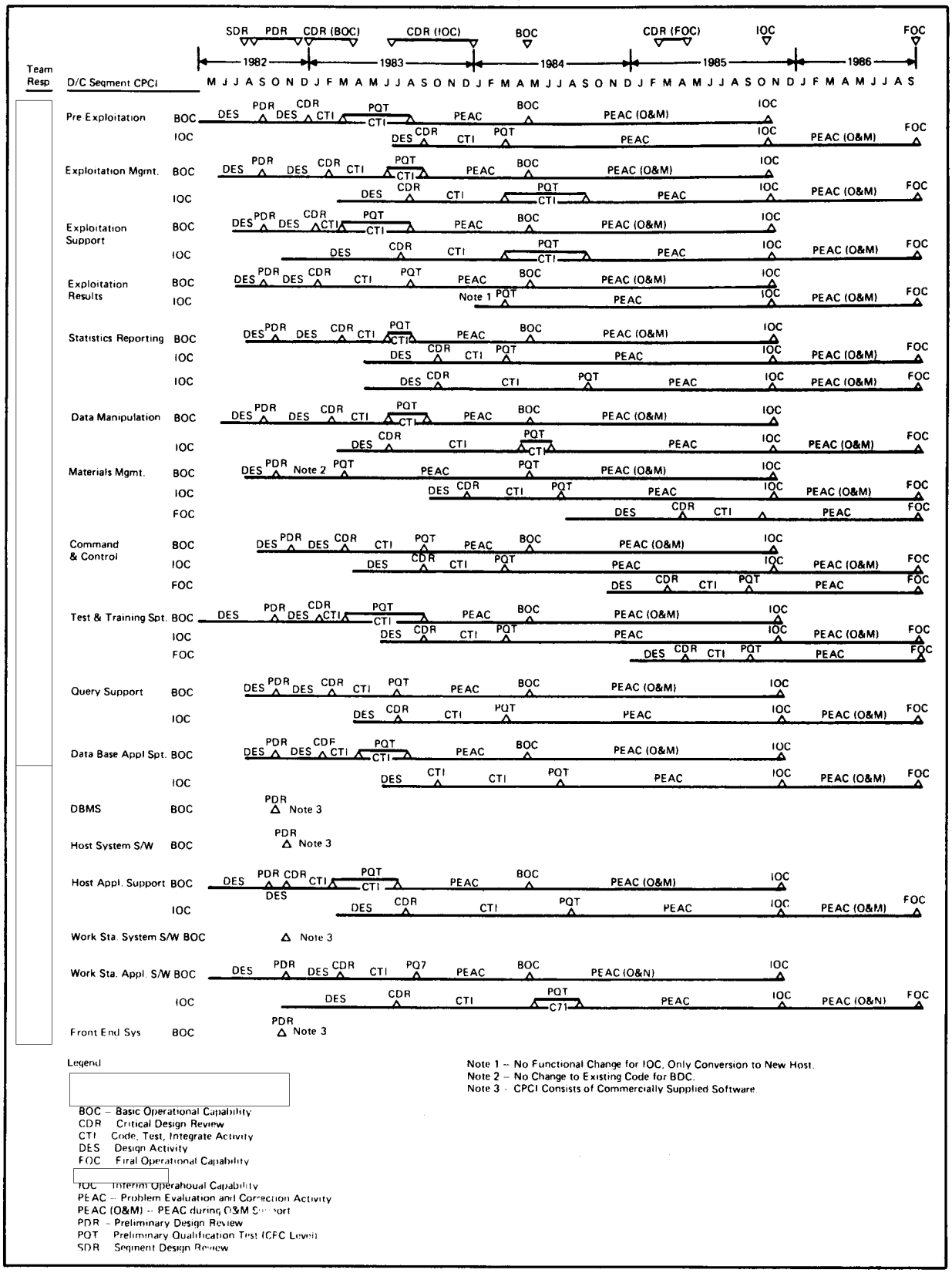

Figure 5.3.3-3. Detail CPCI Development Plan

5.4 IWS Hardware Development Plan

An IWS hardware configuration responsive to NPIC functional and operational requirements will be fabricated using commercially available components. This approach to the IWS hardware development activity is low risk and cost effective.

The concept of the intelligent IWS evolved through the NPIC study and design phase activities. After extensive analysis and breadboarding of available components the following configurations were selected:

a. [redacted] B-20 alpha-numeric terminal to provide full interactive alpha-numeric capabilities and limited local processing to support the administrative staff and analysis supervisors. STAT

b. [redacted] B-20 alpha-numeric terminal integrated with an [redacted] 5216 high resolution, Tempest approved graphics display to provide the full A/N and imagery capabilities to support the analysts. STAT

The remainder of the hardware required by the D/C Segment does not require any development or specification since they are commercially available. Commercial ADPE is not discussed in this plan.

This section presents an overview of the IWS Development Plan including organization and responsibilities, methodology and activity plan.

5.4.1 Organization and Responsibilities

The IWS H/W Development and Acquisition (HD&A) Organization is defined and tailored to accommodate the acquisition, integration, verification and test of commercially available components to develop the IWS.

[redacted] SELECTED TO DEVELOP THE IWS -- While [redacted] retains overall responsibility for the development of the IWS, [redacted] has been selected to perform the hardware engineering, development and installation. [redacted] is uniquely qualified for this role because of their experience in the NDS program designing an IWS responsive to the needs of NPIC. [redacted] is also involved in other projects, such as the Navy IAIPS program, which includes the design and development of work stations to support intelligence analysts. [redacted] currently has an operational IWS Development Laboratory, an operational Hardware Fabrication Facility and a prototype IWS. STAT STAT STAT STAT STAT

HARDWARE DEVELOPMENT AND ACQUISITION ORGANIZATION -- The HD&A organization consists of four departments. Figure 5.4.1-1 is a summary of the HD&A organization and each department's SOW and CDRL responsibilities.

The HD&A manager is responsible for the qualified IWS configurations. He reports directly to the [redacted] D/C Segment Project Manager. Should additional resources or areas of expertise be required, the Project Manager has ready access to obtain these resources. The four departments report directly to the HD&A manager. The Vendor Management Department will place on-site managers at each of the two vendor facilities, [redacted] to insure their adherence to the development schedule, compliance with relevant specifications and to enforce Project Quality Assurance STAT STAT

Standards. In addition, after the initial delivery of IWS units, the Vendor Management Department will monitor the repair cycle of returned items. The Hardware Engineering Department will support System Engineering in development of the CI and Component Specifications, support PDR and CDR of the IWS hardware, including the alpha-numeric terminal to graphics display interface, conduct Mean Time Between Failure (MTBF) and Mean Time to Repair (MTR) analysis, and provide the technical interface between the hardware and software development activities. The Installation and Checkout Department will develop the IWS facility requirements for inclusion in the Transition and Integration Plan, assemble the components into an IWS configuration, perform all tests prior to PQT, and install the IWS units at all locations. The Integrated Logistics Support Department will develop the IWS Maintenance Manual, inputs for the Segment Training Plan, and an IWS Operator's Manual. They will also develop the IWS maintenance concept, and provide for provisioning of spares and maintenance technicians at each Government site.

RELATIONSHIP TO OTHER ORGANIZATIONS -- The HD&A manager will coordinate with all counterparts to ensure integrity of the IWS with the total D/C Segment. Each of the four departments of the HD&A organization are closely linked into other project organizations to insure that the hardware development is fully integrated into the total development effort. The Vendor Management Department will enforce Configuration Management and Quality Assurance standards promulgated by the Project's CM and QA organizations on the two vendors. The Hardware Engineering Department will receive the CI specification from the System Engineering Department and will function as the interface to insure that the evolving software and hardware remain compatible, and that the hardware and software portions of the Segment Development Plan remain complimentary. The Installation and Checkout Department will provide facility requirements, delivery schedules and installation schedules for the Segment Transition and Integration Plan. They will also provide installation technicians to the Project's Installation and Checkout Team and assist in tests and demonstrations at the NPIC installation sites. As installation begins, the Integrated Logistics Support Department will support the Segment O&M organization and become an integral part of the on-site O&M support organization. Details of the O&M Plan are contained in Paragraph 5.6 of this section. The HD&A organization will participate in all project PDR's both internal and external, all CDR's of software and products that have IWS implications, all internal configuration control boards, and all status overviews. All IWS hardware will be subjected to testing by the Project's independent Integration, Test and Transition organization as described in paragraph 5.5.

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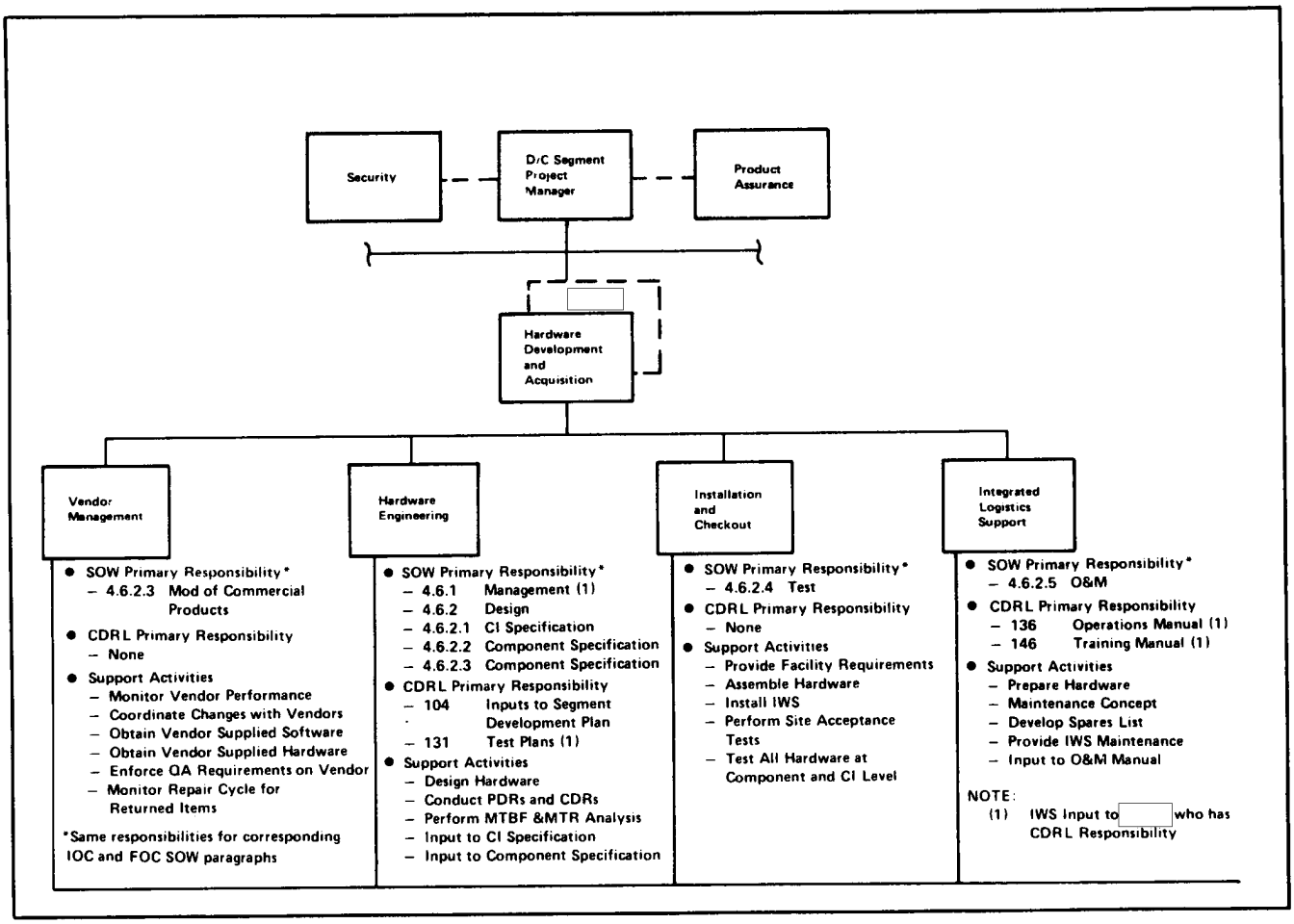

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Figure 5.4.1-1. Hardware Development and Acquisition Organization and Responsibilities

5.4.2 Methodology (Plans & Controls)

The NPIC IWS will be fabricated from commercially available components, without modifications. An interface cable to be used between the alpha-numeric terminal and the graphics display will be developed. The entire IWS will be modified to comply with Tempest requirements.

H/W DEVELOPMENT METHODOLOGY BASED ON USING COMMERCIALLY AVAILABLE COMPONENTS -- Figure 5.4.2-1 provides an overview of our Hardware Development Plan. Even though the IWS hardware will be fabricated from unmodified, commercially available components, comprehensive hardware development management techniques will be used. The hardware will undergo PDR, CDR, PQT, FQT and integration testing. Figure 5.4.2-2 is an expansion of our hardware development plan activities and their relationship to both IWS and segment software development. The core of the hardware development activity will take place in the [ ] Hardware Fabrication Facility (HFF). The HFF is currently operational and includes all equipment, such as Factory Automatic Test Equipment (ATE) and Factory Special Test Equipment, necessary to fabricate the IWS. A prototype IWS is also available. This prototype will be delivered to the [ ] Development and Test Laboratory for use by the Segment system engineers to support their human factors analysis. The development methodology is quite simple. The two component vendors will deliver five (5) [ ] 5216's and ten (10) B-20 alpha-numeric terminals to the HFF. Here the graphics to alpha-numeric interface cable will be designed, fabricated and installed. The resulting five prototype alpha-numeric IWS units and the five IWS units W/CID will be tested at the CI and component level to ensure the proper functioning of all hardware and system software.

STAT STAT STAT

Test and Development Software developed in the [ ] Development Lab will be delivered to the HFF to support the hardware verification effort. The modifications necessary for Tempest qualifications of the B-20 will be determined and implemented. The ten IWS units in the HFF will then be delivered to the [ ] Development and Test Laboratory to support Segment development. By this point, the B-20 vendor will have begun production and delivery to the HFF of 280 B-20 terminals to be prepared for BOC installation and to support reliability and maintainability analysis and testing. [ ] will begin production of the 500 graphics displays and begin delivery to the HFF for assembly in IWS units, test and installation for FOC. All remaining hardware activities are in support of O&M.

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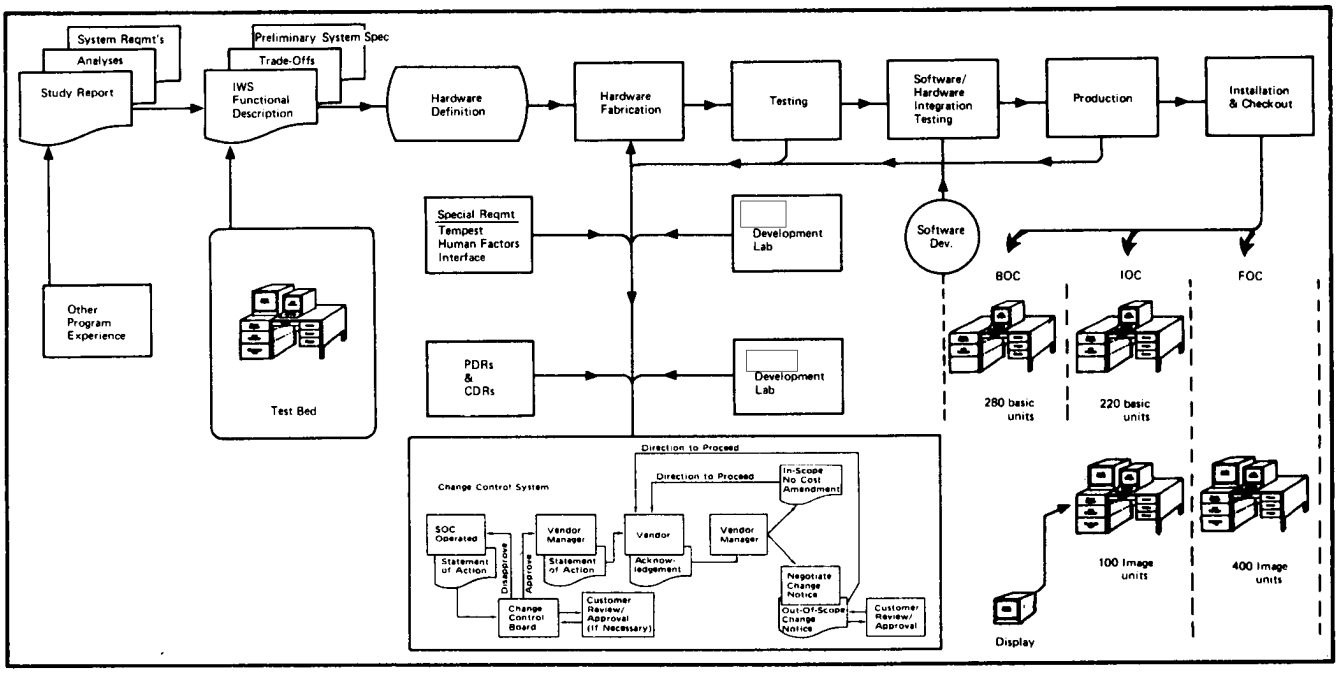

Figure 5.4.2-1. Hardware Development Methodology and Plan

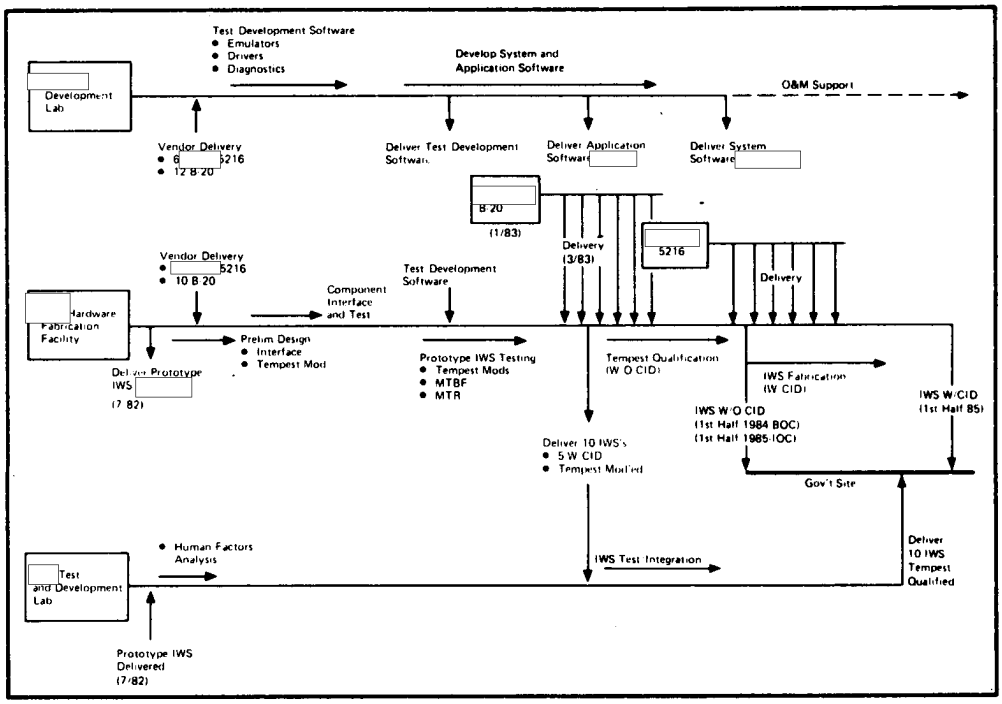

Figure 5.4.2-2. Hardware Development Activity Overview

5.4.3 Activity Plan

Since the IWS Hardware consists primarily of commercially available components, delivery schedule is a minimum risk area.

The first major milestone in our H/W Development Plan is the delivery to the [ ] DTL STAT a prototype IWS in July 1982 which will be used for human factors analysis. After interface and tempest modification designs are made and the test/development software is completed, 10 additional IWS will be delivered to the DTL in August 1983. The production versions of the IWS will begin in January 1984 when 280 A/N IWS will be installed at the Government site. Between January and June 1985, 220 A/N IWS and 100 Imagery IWS will be installed. The final shipment of 400 Imagery IWS will be made between June and September 1985. The Activity Plan schedule that correlates with the WBS is found in Figure 5.4.3-1.

Tempest testing impact on production will be minimized by the use of the [ ] STAT [ ] STAT 5216 identified work station which is currently Tempest-certified with a color monitor. Reconfiguration with a monochrome monitor and Tempest-recertification by an experienced testing organization should not adversely affect the production schedule. Risk containment and cost risk reduction efforts include utilizing off-the-shelf components to minimize hardware/software development and reconfiguration of a Tempest-certified display system (using an established testing organization). Technical risks are reduced as a result of using commercially available components and having a prototype work station available.

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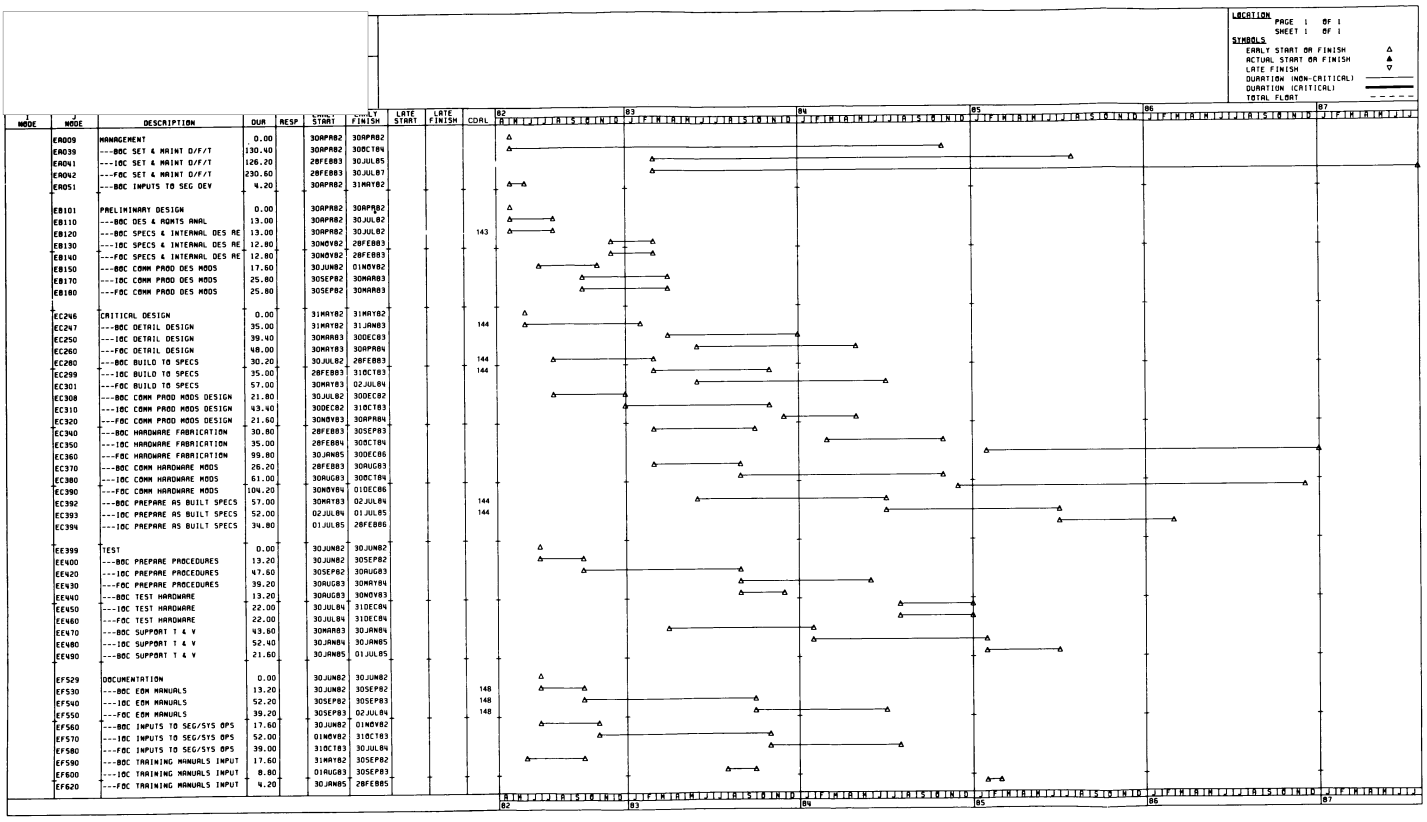

WBS MODE	ACTIVITY NODE	DESCRIPTION	DUR	RESP	EARLY START	EARLY FINISH	LATE START	LATE FINISH	CORL
	EA009	MANAGEMENT	0.00		30APR82	30APR82			
	EA039	---80C SET & MAINT D/F/T	130.40		30APR82	30OCT84			
	EA041	---10C SET & MAINT D/F/T	126.20		28FEB83	30JUL85			
	EA042	---F0C SET & MAINT D/F/T	230.60		28FEB83	30JUL87			
	EA051	---80C INPUTS TO SEG DEV	4.20		30APR82	31MAY82			
	EB101	PRELIMINARY DESIGN	0.00		30APR82	30APR82			
	EB110	---80C DES & RQMTS ANAL	13.00		30APR82	30JUL82			
	EB120	---80C SPECS & INTERNAL DES RE	13.00		30APR82	30JUL82			143
	EB130	---10C SPECS & INTERNAL DES RE	12.80		30NOV82	28FEB83			
	EB140	---F0C SPECS & INTERNAL DES RE	12.80		30NOV82	28FEB83			
	EB150	---80C COMM PROD DES MODS	17.60		30JUN82	01NOV82			
	EB170	---10C COMM PROD DES MODS	25.80		30SEP82	30MAR83			
	EB180	---F0C COMM PROD DES MODS	25.80		30SEP82	30MAR83			
	EC246	CRITICAL DESIGN	0.00		31MAY82	31MAY82			
	EC247	---80C DETAIL DESIGN	35.00		31MAY82	31JAN83			144
	EC250	---10C DETAIL DESIGN	39.40		30MAR83	30DEC83			
	EC260	---F0C DETAIL DESIGN	48.00		30MAY83	30APR84			
	EC280	---80C BUILD TO SPECS	30.20		30JUL82	28FEB83			144
	EC299	---10C BUILD TO SPECS	35.00		28FEB83	31OCT83			144
	EC301	---F0C BUILD TO SPECS	57.00		30MAY83	02JUL84			
	EC308	---80C COMM PROD MODS DESIGN	21.80		30JUL82	30DEC82			
	EC310	---10C COMM PROD MODS DESIGN	43.40		30DEC82	31OCT83			
	EC320	---F0C COMM PROD MODS DESIGN	21.60		30NOV83	30APR84			
	EC340	---80C HARDWARE FABRICATION	30.80		28FEB83	30SEP83			
	EC350	---10C HARDWARE FABRICATION	35.00		28FEB84	30OCT84			
	EC360	---F0C HARDWARE FABRICATION	99.80		30JAN85	30DEC86			
	EC370	---80C COMM HARDWARE MODS	26.20		28FEB83	30AUG83			
	EC380	---10C COMM HARDWARE MODS	61.00		30AUG83	30OCT84			
	EC390	---F0C COMM HARDWARE MODS	104.20		30NOV84	01DEC86			
	EC392	---80C PREPARE AS BUILT SPECS	57.00		30MAY83	02JUL84			144
	EC393	---10C PREPARE AS BUILT SPECS	52.00		02JUL84	01JUL85			144
	EC394	---10C PREPARE AS BUILT SPECS	34.80		01JUL85	28FEB86			
	EE399	TEST	0.00		30JUN82	30JUN82			
	EE400	---80C PREPARE PROCEDURES	13.20		30JUN82	30SEP82			
	EE420	---10C PREPARE PROCEDURES	47.60		30SEP82	30AUG83			
	EE430	---F0C PREPARE PROCEDURES	39.20		30AUG83	30MAY84			
	EE440	---80C TEST HARDWARE	13.20		30AUG83	30NOV83			
	EE450	---10C TEST HARDWARE	22.00		30JUL84	31DEC84			
	EE460	---F0C TEST HARDWARE	22.00		30JUL84	31DEC84			
	EE470	---80C SUPPORT T & V	43.60		30MAR83	30JAN84			
	EE480	---10C SUPPORT T & V	52.40		30JAN84	30JAN85			
	EE490	---80C SUPPORT T & V	21.60		30JAN85	01JUL85			
	EF529	DOCUMENTATION	0.00		30JUN82	30JUN82			
	EF530	---80C EOM MANUALS	13.20		30JUN82	30SEP82			148
	EF540	---10C EOM MANUALS	52.20		30SEP82	30SEP83			148
	EF550	---F0C EOM MANUALS	39.20		30SEP83	02JUL84			148
	EF560	---80C INPUTS TO SEG/SYS OPS	17.60		30JUN82	01NOV82			
	EF570	---10C INPUTS TO SEG/SYS OPS	52.00		01NOV82	31OCT83			
	EF580	---F0C INPUTS TO SEG/SYS OPS	39.00		31OCT83	30JUL84			
	EF590	---80C TRAINING MANUALS INPUT	17.60		31MAY82	30SEP82			
	EF600	---10C TRAINING MANUALS INPUT	8.80		01AUG83	30SEP83			
	EF620	---F0C TRAINING MANUALS INPUT	4.20		30JAN85	28FEB85			

Figure 5.4.3-1. Hardware Activity Schedule

5.5 Verification and Test Plan

The [redacted] team's Integration, Test and Transition (IT&T) organization develops segment tests plans and executes comprehensive test to insure that the segment specifications and requirements are satisfied. The test program is designed to proceed in parallel with the development process to achieve the most efficient schedule.

The test and verification program will be conducted in two phases. Initial testing will be conducted at the [redacted] DTL and are directed at incremental build-up of hardware and software components and integration testing between hardware/software subsystems to ensure ship readiness of the segment to the site. Subsequent testing is conducted at the site, starting with installation and checkout and ending with successful completion of operational readiness tests. The aggressive schedule will be satisfied by parallel development of segment hardware and software, and early testing by the IT&T organization on incremental hardware and software capabilities as they become available.

5.5.1 Organization and Relationships

The IT&T organization is independent from the Segment Development organization to promote a totally objective and comprehensive verification process.

IT&T DIVIDED INTO FOUR DEPARTMENTS -- The Segment Planning Department is responsible for all test, integration and installation planning. The Verification and Test Department is responsible for the execution of all formal tests and demonstrations. The Training Department is responsible for providing both initial and ongoing training to Segment and System users, Operators and Maintenance personnel. The Operations and Maintenance (O&M) Department is responsible for all post-installation O&M. The manager of the IT&T organization reports to the Project Manager and will provide management of all segment test, installation and checkout, training and)&M activities. The IT&T organization and its SOW and CDRL responsibilities are contained in Figure 5.5.1-1.

MAJOR [redacted] ROLE IN IT&T ORGANIZATION -- While [redacted] retains overall responsibility for the IT&T program, [redacted] will produce all of the CDRL items assigned to the IT&T organization. [redacted] has been selected for this role to take maximum advantage of their ten years experience with the current NPIC system, including test and integration of portions of the current operational software. By using [redacted] in this role [redacted] has maximized the independence of the software development activity and the test and verification program; a technique that has been proven to enhance the quality of systems under development.

IT&T ORGANIZATION INTERFACES WITH OTHER ACTIVITIES -- From the Project System Engineering Department, the IT&T organization will receive the Segment Test Plan and the Segment Verification Plan for implementation. In addition, the various specifications that form the basis for test design will be provided, such as the Segment Design Specification, the Data Base Specification, the various interface specifications and the Part I Specifications. Interface with the Software Development Department includes receipt of Computer Program Components (CPCs) upon which to base PQT and FQT tests. Program Trouble Reports for any software that fails a level of testing will be provided to the Software Development Department for analysis and resolution. Software and hardware will be provided to the IT&T Organization for formal testing through the CM function. All support provided to the SI for customer site tests and demonstrations, including inputs, test execution and reporting will be provided by the IT&T organization. The IT&T will interface with the NDPO while designing the required CDRL items, by participating in PDR's and CDR's and providing test results analysis and test reports.

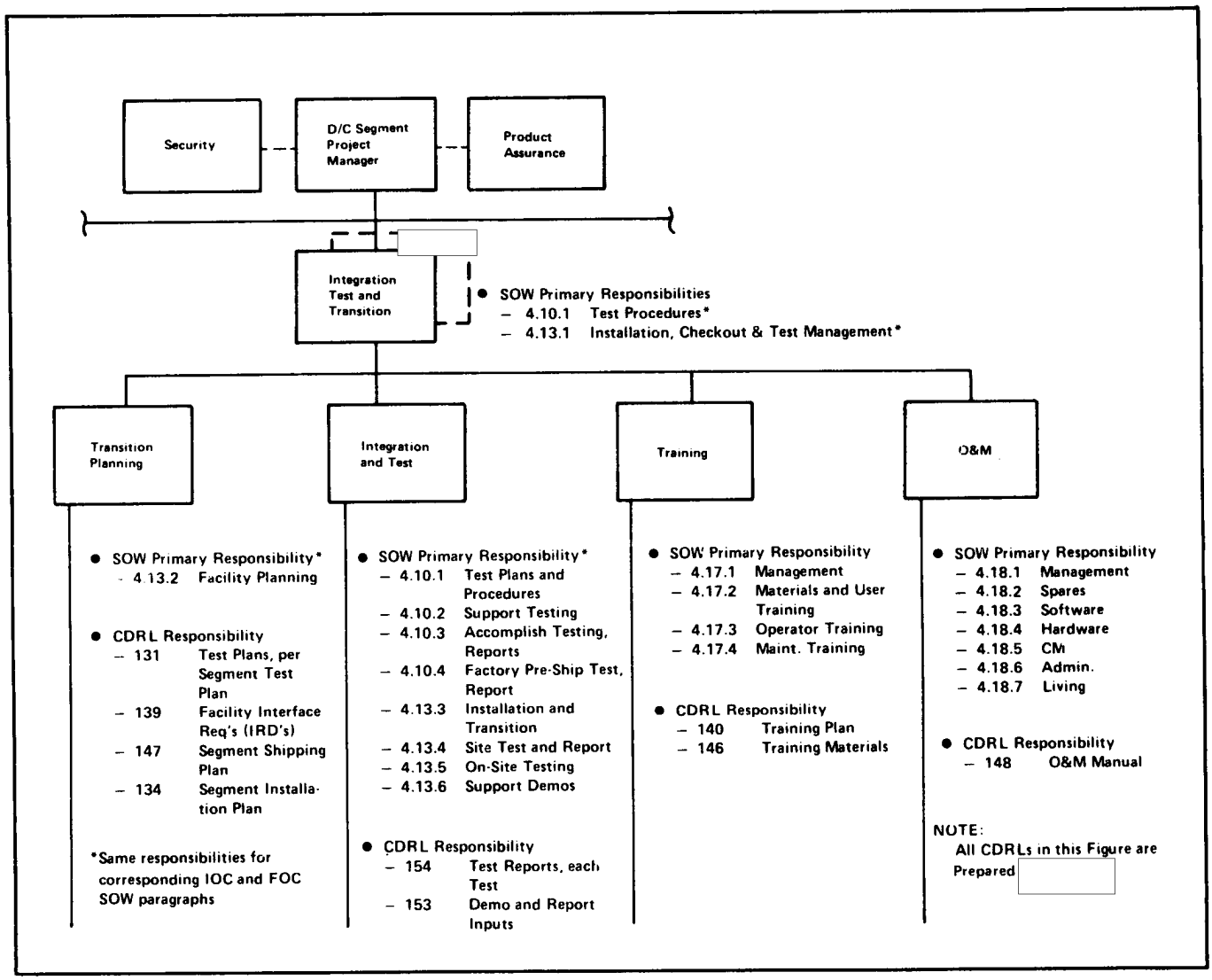

Figure 5.5.1-1. Integration Test and Transition Organization and Responsibilities

5.5.2 Methodology

Segment Testing insures that each requirement in the specification is satisfied and the D/C Segment performs in a qualitive and quantitative manner as originally designed.

BUILDING BLOCK APPROACH USED FOR VERIFICATION -- The test program is a multilevel verification sequence, requiring quality conformance check points to be satisfied before proceeding to each higher level of testing. Figure 5.5.2-1 provides an overview of the complete Test and Verification program.

TEST PLANS ARE BASED ON REQUIREMENTS FROM D/C SEGMENT SPECIFICATIONS -- NPIC requirements and program implementation test directives were allocated to the D/C Segment Design Specification in the DCP Phase. These Design Specifications will be allocated to the appropriate CPCI/CI Part I Development Specifications during SAP. The test requirements will be allocated to the specification Quality Assurance sections and also provide inputs to the Test Plans. The Requirements Traceability and Verification Matrix shown in the Technical Proposal (Appendix A3) will trace these allocations.

VERIFICATION PLAN PROVIDES GUIDANCE TO THE TEST PROCESS -- The Segment Verification Plan provides primary guidance as to the verification methods, analysis, inspection, test and demonstration to be used during testing. The plan contains a Verification Status Matrix for each formal test and will be completed at the post-test briefing session following a formal test activity. At pre-ship CM will audits these Verification Matrices and review them as part of the acceptance process. Figure 5.5.2-2 provides an overview of the Verification Plan including the test categories, documentation, verification method, tools and responsibilities.

TEST PROCEDURE -- Each test is planned, performed and documented by the responsible organization using qualified test tools and equipment. Tests are conducted using test plans and procedures prepared by Engineering, System Engineering, Software Development, or Transition, Integration and Test. The method of specification requirements verification is driven by the Segment Verification Plan.

OPERATION READINESS TESTS -- Successful operational readiness tests will be concluded with trained operators, users and managers in a simulated real time environment. The Integrated NPIC System will be used to train operations personnel using simulated scenarios, manuals, positional guides and checklists.

TOOLS FACILITATE TESTING -- Diagnostic tools provide the capability for integrating the communications network with the host computer and the integrated work stations. The Test and Training CPCI provides the scenario generation capability to conduct formal software tests and serves as an aid in the training activities. The Teleprocessing Network Simulation program provides the capability of simulated loading of terminals to verify response timings. Data Reduction tools will support the analysis of the test results.

TESTING DOCUMENTATION -- Testing documentation is tailored to specific tests and confroms to the data requirements. CPCI and CI formal test plans will be developed in accordance with the Segment Verification and Test Plans and will be reviewed in PDR's and CDRs prior to testing. Site planning for equipment layouts and segment shipping will be documented in advance. CPCI test plans will be submitted incrementally as appendices to a summary index volume. Test reports will be sumitted at the conclusion of each formal test. An overview of the Test Documentation Tree is presented in Figure 5.5.2-3.

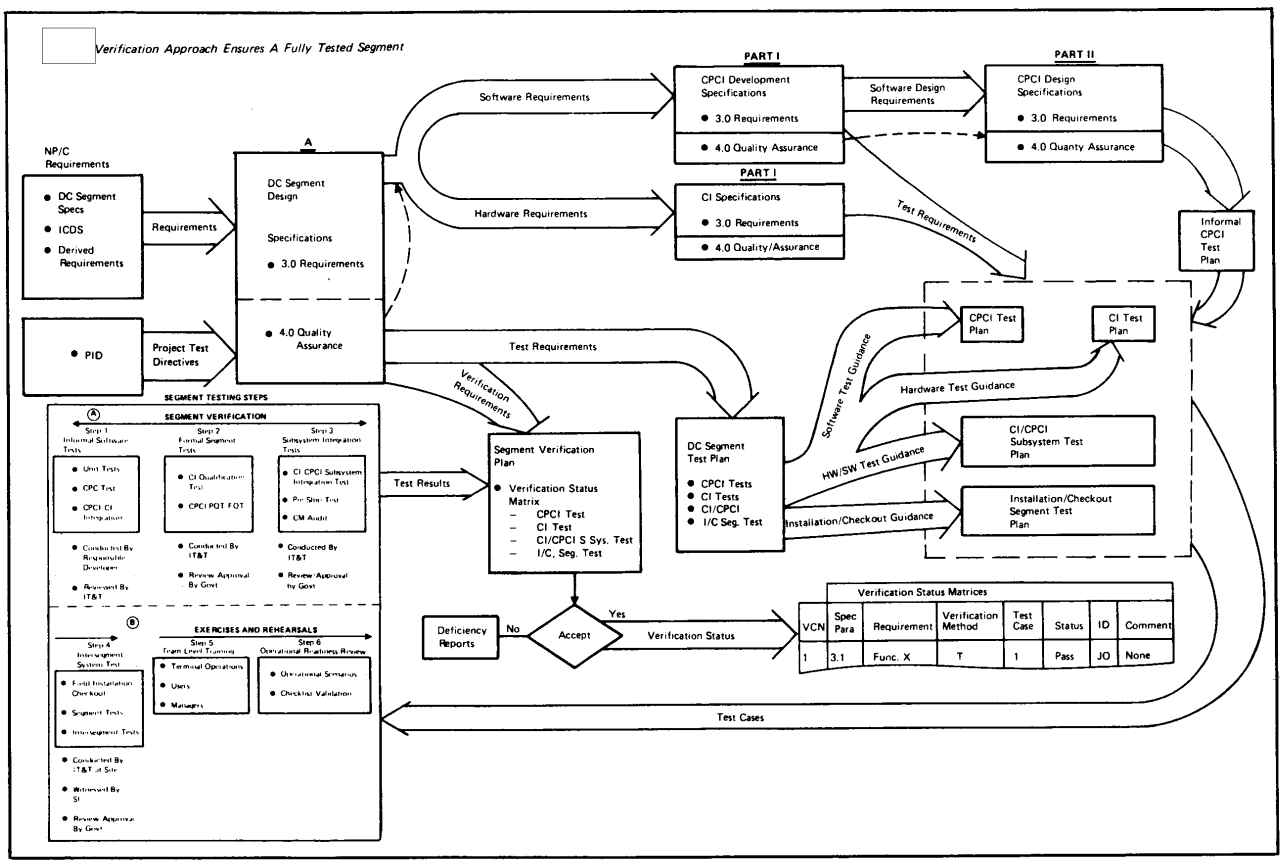

Figure 5.5.2-1. Test and Verification Methodology Overview

Test	Test Documentation	Verification Method	Test Tools/Equipment	Responsibility
Algorithm Evaluation Test	Internal	Inspection Analysis Test	Test Programs/Utilities	System Engineering
Engineering Test and Evaluation	Internal	Inspection Test	Scopes, Meters/Sig. Generators Comparators, Test Program Drivers	Hardware Engineering
Unit	Internal	Inspection Test	Static Data, Debug Aids (Trace, Dumps)	Software Development
CPC	Internal	Inspection Test	Test Drivers, Debug Aids	Software Development
Informal H/S Integration	Internal	Demo Test	Diagnostics, Scopes, Data Generators, Recorders, High Speed Dumps	IT&T Software Development
Prelim. Qual.	Approved Plans/ Reviewed Procedures	Test	Test Drivers, Scenario Generator, Data Log, Data Reduction Programs	IT&T
Formal Qual.	Approved Plans/ Reviewed Procedures	Test	Scenario Generator, Data Log, Data Reduction Programs	IT&T
CI Qual.	Approved Plans/ Reviewed Procedures	Test	Scenario Generator Data Log, Data Redirector, Operator Inputs	IT&T
H/S Subsystem	Approved Plans/ Reviewed Procedures	Demo Test	Scenario Generator, Data Log, Data Reduction Program, Teleprocessing Network Simulator, GFE Simulators	IT&T
Installation/ Checkout Intrasegment	Approved Plans/ Reviewed Procedures	Inspection Demo Test	Diagnostics, Scenario Generator, Data Log, Data Reduction Programs	IT&T
Intersegment H/S	System Integration Test Plan/Procedures Prepared by SI	Demo Test	Scenario Generator, Data Log, Data Reduction Program, Test Data Base, Operator Inputs	SI
Team Level Training	Training Plans	Demo	Test Data Base, Scenario Generator, Data Log, Data Reduction Program, Operational Position Procedures	IT&T
System Operation Readiness	Scenarios/Checklists	Demo	Simulated Data, Operational Checklists, Trained Govt. Personnel	GOVT.

Figure 5.5.2-2. Segment Verification Plan

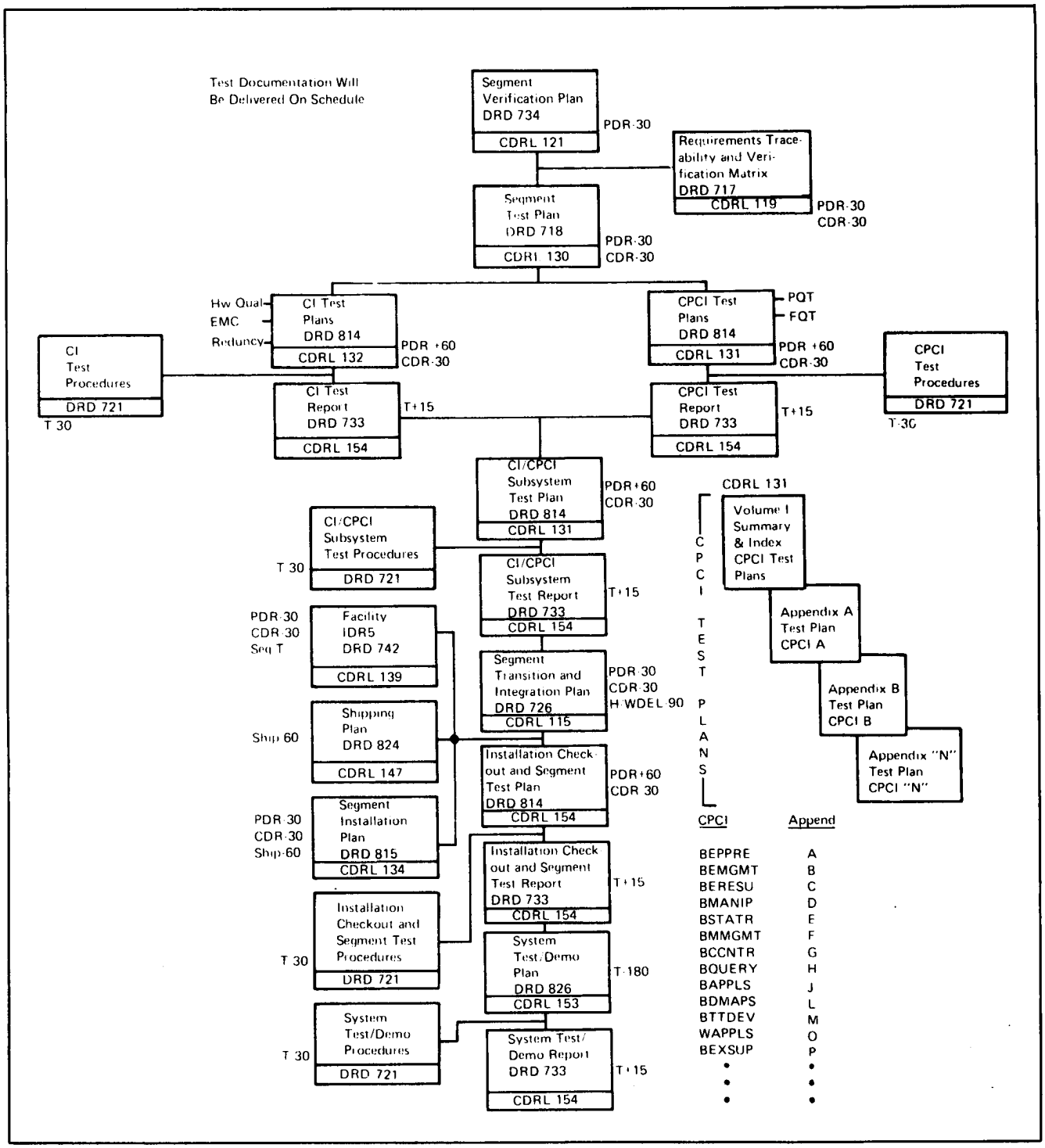

Figure 5.5.2-3. Test Documentation Tree

5.5.3 Activity Plan

Verification and Test Activities are consistent with the master schedule and meet the project milestones by incremental integration and testing in parallel with software development.

Development integration and testing of CPCI and CPCs will be conducted using an incremental approach, emphasizing control and visibility of the software products. CPCs will be tested independently then grouped into strings for inter CPCI integration and test. Strings will be integrated one at a time; building on the first string as the baseline. Figure 5.5.3-1 shows CPCI source lines of code integrated and tested per quarter. The major milestones for integration and testing for each CPCI are shown in Figure 5.5.3-2. The test planning, transition documentation and test activities time lines are detailed in Figures 5.5.3-3.

CPCI/CPSs Will be Incrementally Integrated and Tested.

	1983				1984				1985			
CPCI	1	2	3	4	1	2	3	4	1	2	3	4
BEPPRE	23.8	44.5	47.3		7.2	11.0						
BEMGMT	23.3	14.0		20.3	23.3	8.0		54.3				
BEXSUP	70.0		93.0	2.5								
BDDMSI*												
BMANIP			99.4			85.7						
BSTATR			13.0	32.0	2.9							
WSYSTM*												
BMMGMT							8.0		13.0	13.0	0.5	
BCCNTR			4.0		27.0				4.0	4.0	4.0	
BQUERY			24.3		38.8							
BAPPLS		34.3	32.4	18.5			5.0					
BDMAPS		6.0	9.0	2.7		7.0	29.0	0.5				
BTTDEV	13.9			7.2	18.0					5.0		
BERESU	37.0			24.2								
BSYSM*												
WAPPLS	25.0	25.0	55.5	55.5	55.5	55.5						
FE SYS SW*												
TOTAL	193.0	123.8	377.9	162.9	173.7	167.2	42.0	54.8	17.0	22.0	4.5	

*Commercially Supplied

Figure 5.5.3-1. Source Lines of Code ($X10^3$) Integrated/Tested per Quarter

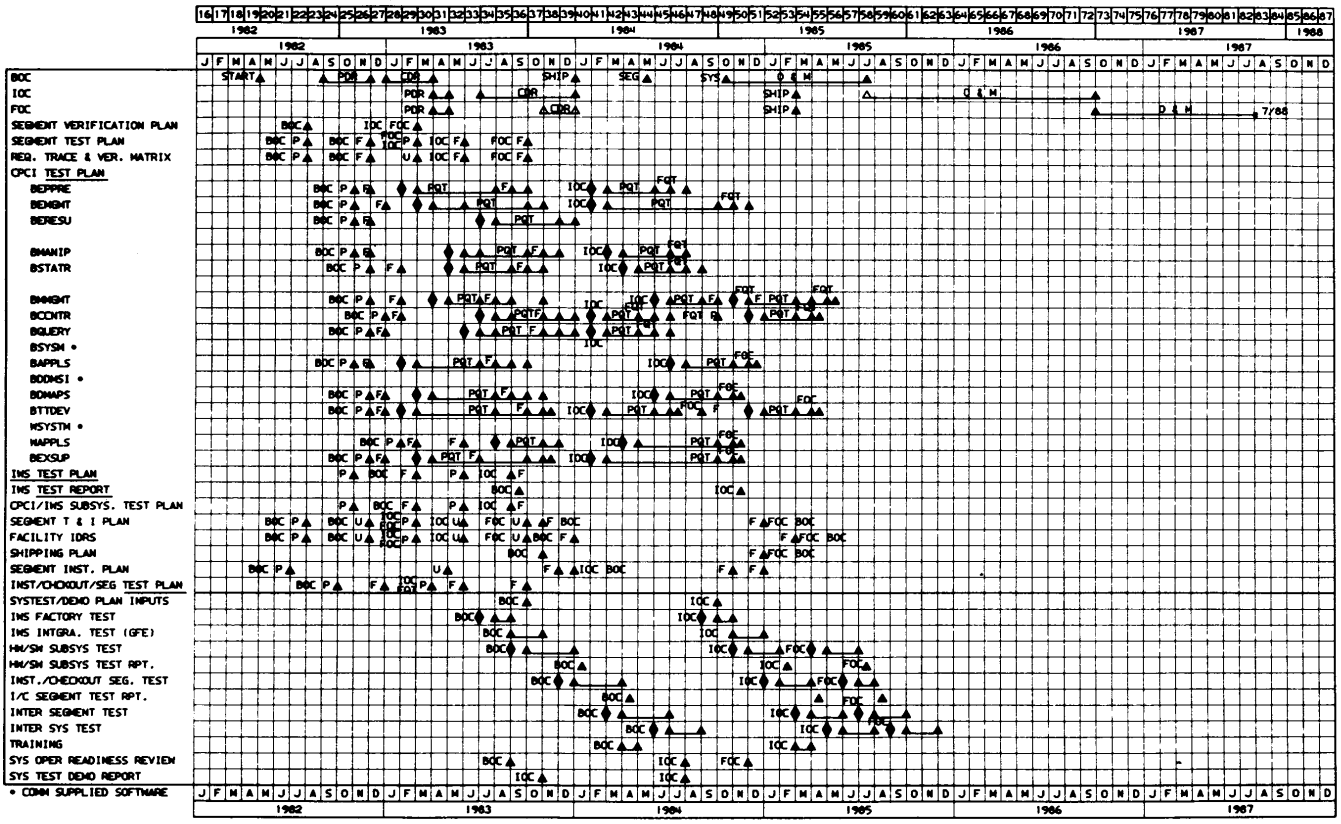

Figure 5.5.3-2. IT&T Major Milestones

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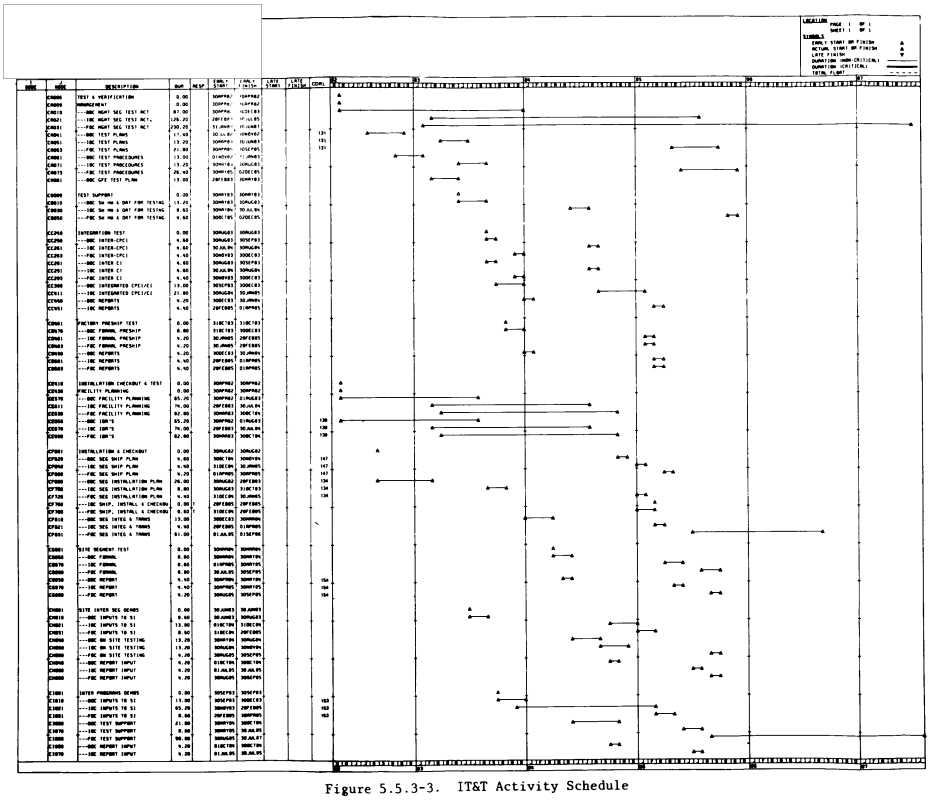

Figure 5.5.3-3. IT&T Activity Schedule

5.6 Operations and Maintenance Plan

[redacted] *understands the importance of O&M activity to the success of NDS and will provide an experienced team for all necessary support to NDS during this critical phase of the project.*

The primary objective of the O&M activity for the D/C Segment is to maintain the system and to provide technical support on-site for the BOC, IOC, and FOC O&M periods. Our approach to O&M is cost effective because it is based on a limited number of on-site staff that relies heavily on off-site support to meet system needs as they arise.

A summary of the features of this O&M Plan are:

a. On-site maintenance support at both [redacted]

b. [redacted] Field Engineering Division maintains standard software products and commercial hardware under standard GSA contract.

c. On-site, depot level repair of Integrated Work Stations with the Government assuming responsibility for half the IWS maintenance workload.

d. Factory Development and Test Laboratory and off-site expertise used for application Software maintenance through IOC Factory Acceptance Testing (FAC).

e. All required expertise consolidation on-site O&M team after IOC-FAC.

f. OJT for Government Software Personnel by participating in Applications Software problem analysis and resolution. An assumption is made that Government personnel will be responsible for approximately half of the S/W maintenance during the O&M time frame.

g. Active participation and cooperation with NDPO, SI and Configuration Control Boards.

h. Formal Discrepancy Report Procedures established to monitor all problems and track their timely resolution.

This O&M Plan is related to the other plans in this section by requiring reference material inputs from Systems Engineering (requirements and design), Software Development (CPCI documentation), Hardware Development (IWS documentation), Verification and Test (diagnostics and acceptance criteria) and Training (user, operations and maintenance procedures).

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5.6.1 Organization and Relationships

Two distinct O&M organizations have been structured--the initial organization makes full use of the Factory Development expertise through IOC factory acceptance testing and the latter organization consolidates this expertise on-site after the Development and Test Laboratory is closed.

O&M PHASE 1 ORGANIZATION DESCRIPTION -- The initial organization maintains a close relationship between our on-site O&M staff and our off-site (factory) development expertise. The on-site staff will provide direct contact with system users and the NDS Operations Staff to respond to discrepancy reports (DR) and to provide initial assessments of problem diagnosis, required resources and time frame required to accomplish corrections. The on-site staff also provides maintenance and depot-level repair of integrated work stations and maintenance of [ ] hardware and standard software products by the [ ] Field Engineering Division. STAT STAT

Figure 5.6.1-1 delineates the O&M Phase 1 Organization and Responsibilities in relation to SOW tasks and planned activities. The O&M manager will be on-site and will be a single point of contact for all O&M activity. Three groups will also reside at the site. The Technical Support Group will be primarily responsible for analyzing discrepancy reports and assuring the problems are adequately resolved. The Hardware Maintenance Group will be primarily responsible for the repair of the Integrated Work Stations and the commercial hardware. The Software Maintenance Group will be responsible for coordinating all software fixes including standard S/W products and application programs. During the Phase 1 organization time frame, most application software problems will be analyzed and resolved at the Factory rather than at the site. The Project Control Office will maintain configuration control and update all required documentation to assure consistency in the baseline.

O&M PHASE 2 ORGANIZATION DESCRIPTION -- The Development and Test Laboratory will be closed after the IOC Factory Acceptance Test and the required expertise to maintain the D/C Segment will be transferred to the on-site location. The Phase 2 organizational structure and responsibilities are shown in Figure 5.6.1-2. Each organizational group will retain their basic responsibilities from the Phase 1 organization with the following exceptions: The Technical Support Gourp will take on the additional responsibility of coordinating computer time and developing procedures at the site for problem isolation and resolution since the Factory computer facilities will no longer be available. The Software Maintenance Group will take on the additional responsibility of correcting all application code problems. However, this group will have on-call backup expertise available at the Factory in the Engineering Support Group if the need does arise.

JUSTIFICATION -- The two phase approach to O&M organization is justified based on the availability of the Development and Test Laboratory at the factory. The objective in the Phase 1 organization is to provide a limited number of on-site personnel while supporting the maintenance of the H/W and S/W with the best expertise available. This expertise will be selectively transferred to the site upon the closing of the lab. The structure of the O&M organization is justified based on the following factors:

a. An O&M manager is needed to serve as a single point of contact for all O&M activities at the site.
b. A Technical Support Group is needed to evaluate Discrepancy Reports to coordinate and assign responsibility for resolution, and to assure that the fix adequately resolves the problem.

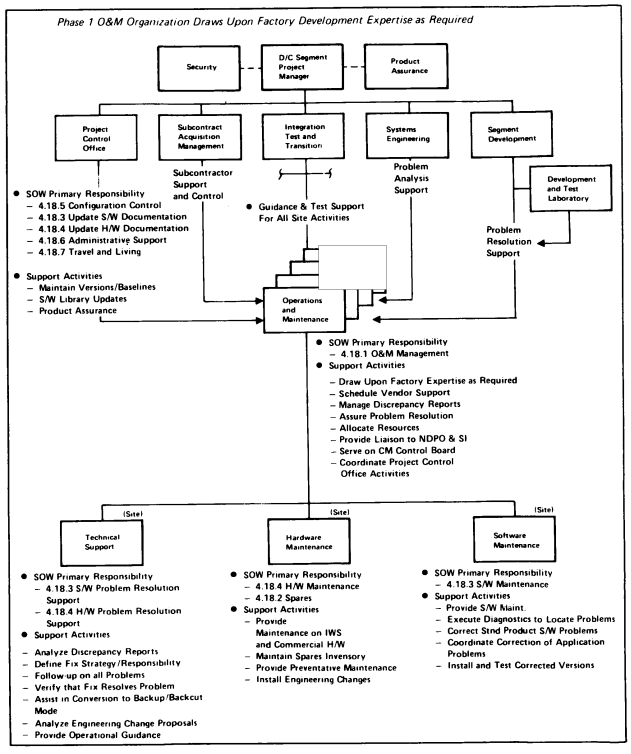

Figure 5.6.1-1. Phase 1 O&M Organizational Responsibilities

c. A Hardware Maintenance Group is needed to maintain both the IWS and the standard commercial hardware [redacted] and to assure a consistent approach to maintenance is followed. STAT

d. A Software Maintenance Group is needed to coordinate and resolve all software fixes--both in standard software products and in application code and to assure that segment and system integrity is maintained throughout O&M.

ORGANIZATIONAL RELATIONSHIPS -- Within the [redacted] D/C Segment organization, the O&M STAT organization relies heavily on the Project Control Office for configuration and documentation of the baseline. The Subcontract Acquisition Management department manages the subcontractor support needed during O&M. The Systems Engineering and Segment Development groups provide off-site support to O&M in problem analysis and resolution as needed. After the closure of the Development and Test Laboratory, the Project Office will assume Subcontractor Management functions and the systems engineering and development expertise will be consolidated into an Engineering Support function.

The O&M organization will support the NDPO and the SI in operational analysis and problem resolution. In addition, the O&M organization will actively participate in the Interface Control Working Group with other Segment contractors and the NDPO Con- STAT figuration Control Board.

Following each major delivery (BOC, IOC, FOC), Current Operational Capability (COC) baseline H/S/O items will be conducted to provide the departure point for O&M configuration Control. Management of H/S/O products during O&M periods will take place largely through tracking DRs, Requests for Change, Engineering Change Proposals (ECP), Specification Change Notices (SCN) and MTMs. Through accurate accounting procedures, the status and priority of any change will be followed through to implementation. IBM will provide NPIC on a periodic basis a summary of pertinent change status information reflecting all active change documents.

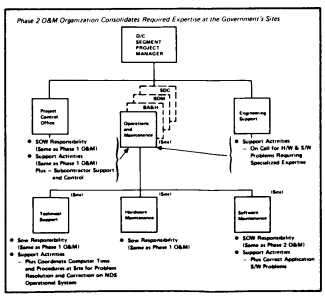

Figure 5.6.1-2. Phase 2 O&M Organizational Responsibilities

5.6.2 O&M Methodology

The O&M methodology is based on a User Generated Discrepancy Report which triggers a formal procedure to isolate and resolve all problems while maintaining system integrity.

PROCEDURE DESIGN FOR EXPEDITIOUS PROBLEM SOLVING -- The current NPIC Discrepancy Report (DR) will be used to formally document and describe the occurrence of a reported anomaly in hardware/software/operations (H/S/O) delivered products. DRs are written for either operational or pre-release versions of these products. These reports will be treated as work orders to investigate problem areas and to modify any system component sufficiently to make that component function as specified in the requirements or design specification. Discrepancy Reports will not be used to authorize the acceptance of a new or changed requirement or authorize a system enhancement. Changes to the System as depicted by a DR will be evaluated and authorized under a separate procedure outside of the scope of this O&M organization.

Figure 5.6.2-1 shows the flow of a Discrepancy Report through the planned O&M procedure. The on-site O&M manager (or a technical representative in his absence) will receive all reported discrepancies, analyze impact on ongoing operations and classify the critical level of the discrepancy. Four critical levels will be defined:

a. Level 1 denotes that the problem results in a critical impact on software operations and an immediate action is required that takes priority over all other O&M activities.
b. Level 2 denotes that the system is operable but severely restricted and requires action as soon as the system can be made available for repair.
c. Level 3 denotes that the system is operable with only minor restrictions which are not critical to overall operations. The actions for this level will be scheduled behind the higher priority discrepancies under current investigation.
d. Level 4 denotes that the problem has been circumvented by an initial fix, but further evaluation may be required to assess what further action may be required.

After assigning the critical level to the DR the O&M manager gives the DR to the Technical Support Group for detailed analysis. This group interacts with the user to reconstruct the problem and assigns responsibility to either the H/W or S/W Maintenance Groups.

COMMERCIAL HARDWARE MAINTENANCE -- All D/C Segment [redacted] hardware will be maintained under a standard GSA contract. Local customer engineers (CE) from the [redacted] Field Engineering Division will provide all necessary tools, test equipment, parts, diagnostics and reference materials to maintain [redacted] commercial hardware. [redacted] maintenance software packages, together with built-in CPU and I/O controller microdiagnostics aid in making rapid diagnosis, off-line repair and on-line verification of the repair, often without impacting users and other components. Backing up the CEs for standard product maintenance are local area specialists who provide technical support in particularly complex situations. CEs also have access to symptom/fix and parts support information from data banks of historical information at large system support centers and through the Remote Technical Assistance Information Network (RETAIN). Access to this data is through toll-free telephone calls. The CE provides the center with the symptom and a data base search is made to match the symptom and repair.

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INTEGRATED WORK STATION HARDWARE MAINTENANCE -- To provide complete and timely support for all delivered integrated work stations, we will supply technicians at the site as scheduled and at [redacted] during time of inspection. At [redacted] STA
[redacted] we will provide a depot level maintenance facility together with a parts cache STA
to allow rapid repair/replacement of IWS components and thus provide uninterrupted service to the user. At the site maintenance will involve the replacement of lowest replaceable units (LRU) and replenishment from [redacted] stock. Larger failed STA
components would be shipped from the site for repair at the [redacted] depot main- STA
tenance facility and then returned. Any repairs beyond the capability of the maintenance facility would be forwarded to the IWS Development Facilty for major repair or replacement. We will provide a full-time maintenance manager at [redacted] to STA
manage all IWS maintenance and to interact with the IWS development facility for personnel augmentation support and for resolution of non-maintenance related user/operational problems.

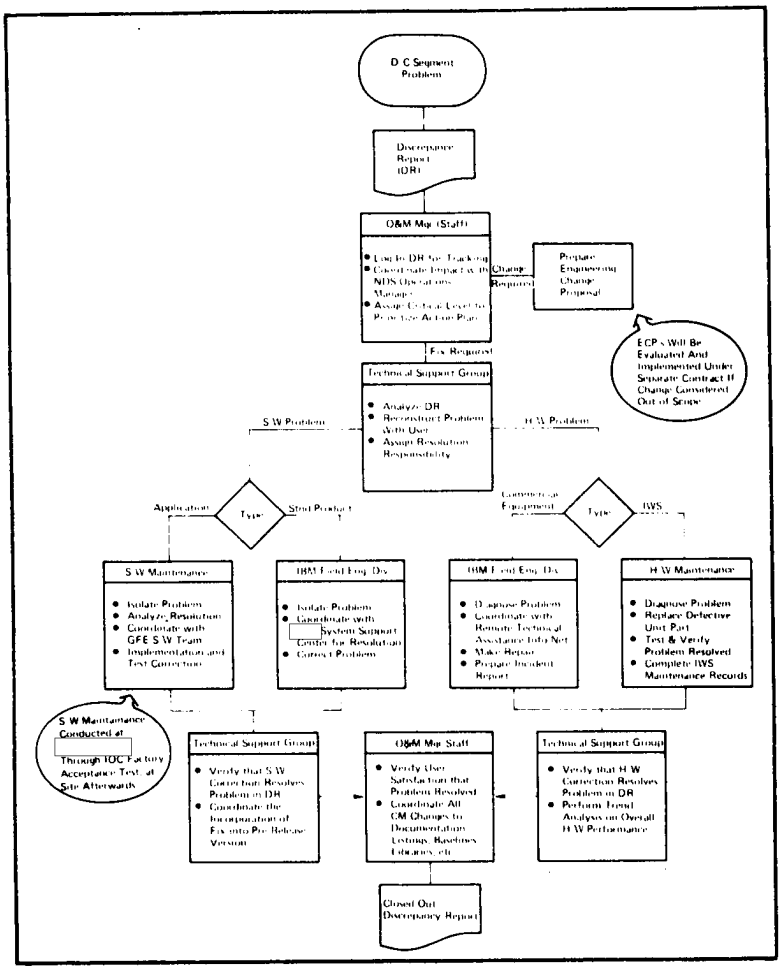


Figure 5.6.2-1. Discrepancy Report Process Flow

5.7 Training Plan

A comprehensive and customized training program will be based on this plan which will provide instruction to NPIC personnel in the use, operation and maintenance of the D/C Segment.

As prime contractor, [redacted] retains ultimate responsibility for all training tasks; however, [redacted] will coordinate and perform the actual training functions. [redacted] has selected [redacted] for this important effort based on the fact that they have extensive experience in developing large training programs for various Government agencies including the NPIC. STAT STAT STAT

The [redacted] team has analyzed the unique challenges that the NDS program presents to the development of an effective training program. This Training Plan is guided by the strategies shown in Figure 5.7-1 which depicts our plans to address each cited challenge. STAT

We Have Anticipated the Training Challenges and Have Developed a Tailored Strategy to Address Each Area of Concern.

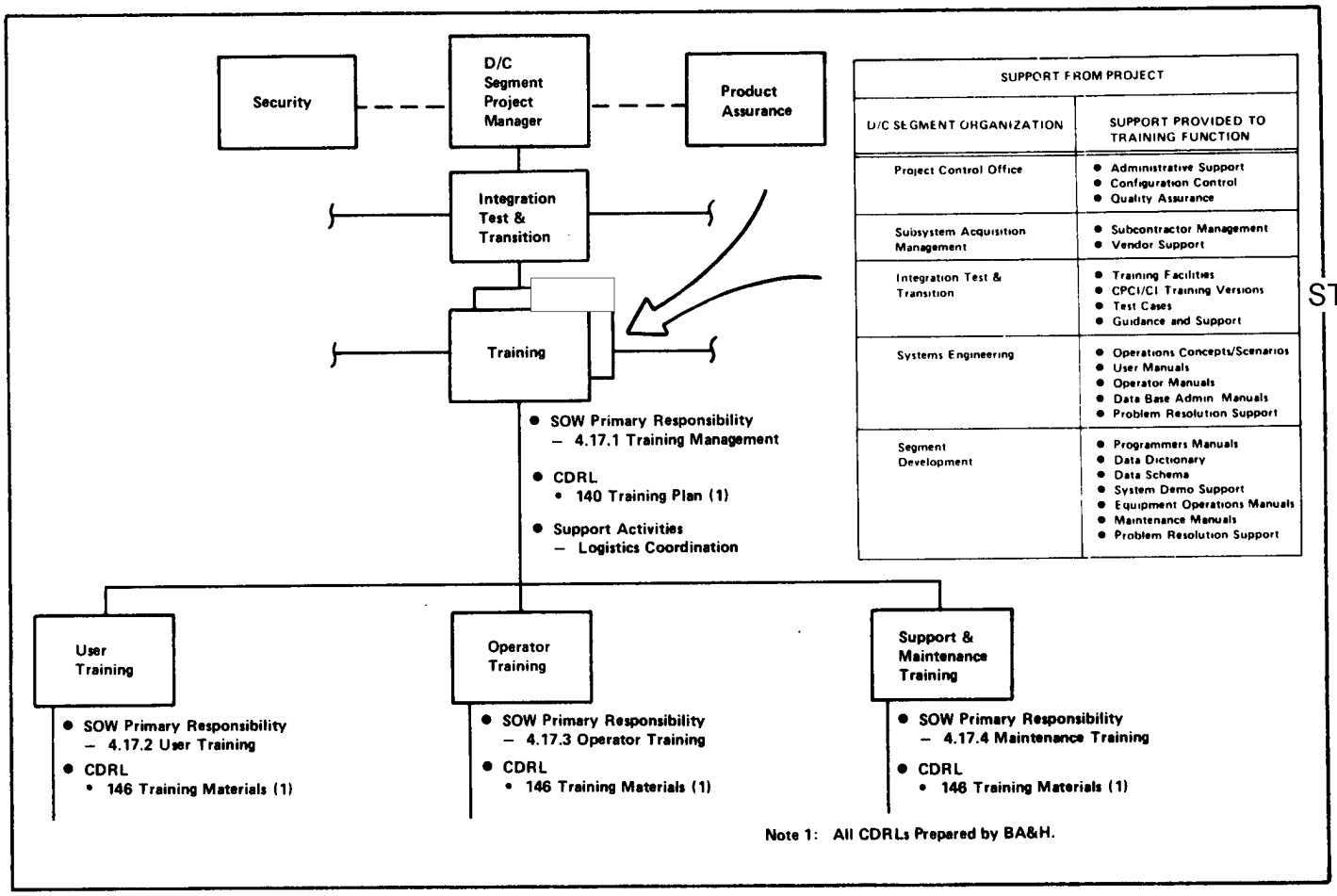
STRATEGY TO ADDRESS TRAINING CHALLENGES	
CHALLENGE	**STRATEGY**
1. Meeting quality standards within a compressed time frame.	• Conduct parallel activities where possible instead of making activities sequential. • Monitor progress of all activities through weekly staff meetings.
2. Coordinating a multitude of diverse activities.	• Comprise training team of experienced BA&H staff who have worked together in similar situations. • Assign coordinator of logistics. • Establish a continual liaison function with NPIC training staff. • Maintain a detailed training plan specifying milestone events and time schedule.
3. Accomplishing review and approval of all program plans and products in a timely fashion.	• Inform all personnel of priorities. • Centralize and coordinate the distribution of draft materials for review. • Maintain task preparation and delivery schedule, as well as review and approval schedule.
4. Assuring that training meets approval of NPIC.	• Review with NPIC all drafts of materials and methodologies • Conduct pilot programs for NPIC review. • Revise plans and materials as necessary.
5. Designing a program to reflect the structure, procedures, and dynamics of NPIC.	• Comprise a team of trainers familiar with NPIC operations. • Schedule periodic meetings with NPIC. • Use NDS internal documentation in training program design.
6. Presenting the program of instruction in a manner relevant and practical to participants.	• Focus on performance appraisal as an essential management tool. • Design NPIC specific cases, exercises, situations, etc. • Utilize coaching, counseling techniques, case studies, "hands-on" exercises and the methodologies that enhance application of concepts.
7. Defining and quantifying job components for a variety of positions.	• Assign trainers who have extensive experience in determining critical job elements and performance standards for a diversity of positions.
8. Producing quality training materials in a timely manner.	• Use the Project Graphics and Print Shop to product all materials.
9. Delivering the training in an efficient, timely and effective manner.	• Assign a logistics coordinator to work with NPIC prior to and during training to coordinate facilities, materials, and scheduling of participants and training sessions.
10. Anticipate resistance of participants to training.	• Select a team of trainers familiar with NPIC procedures and structure and the intelligence environment. • Capitalize on the extensive human relations/group dynamics backgrounds of trainers. • Plan sessions to allow for flexibility of scheduling by participants. • Assist NPIC in drafting and issuing memoranda to all involved personnel informing them of the training program.

Figure 5.7-1. Training Challenges

5.7.1 Organization and Relationships

Our Training Organization will specialize in three areas: User, Operator and Maintenance/Support training and will make full use of the expertise in D/C Segment organization to assure a high quality and comprehensive training program.

A RESPONSIVE AND FUNCTIONALLY-ORIENTED ORGANIZATION -- Our training organization has been functionally structured to be totally responsive to the SOW and to provide the required level of support throughout the SAP. Figure 5.7.1-1 depicts the Training organization, along with each group's SOW and CDRL responsibilities. This Training Plan delineates the activities that will prepare and deliver training materials for system users, Government instructors, operators, data base administrators and maintenance personnel. In addition, the Training organization will coordinate facilities and schedules of individual training sessions. Also shown is the relationships between the five major D/C Segment project functions and the training function. Depicted are the supporting items and activities that will be provided by those five functions in order to achieve an effective training program.



SUPPORT FROM PROJECT	
D/C SEGMENT ORGANIZATION	SUPPORT PROVIDED TO TRAINING FUNCTION
Project Control Office	• Administrative Support • Configuration Control • Quality Assurance
Subsystem Acquisition Management	• Subcontractor Management • Vendor Support
Integration Test & Transition	• Training Facilities • CPCI/CI Training Versions • Test Cases • Guidance and Support
Systems Engineering	• Operations Concepts/Scenarios • User Manuals • Operator Manuals • Data Base Admin Manuals • Problem Resolution Support
Segment Development	• Programmers Manuals • Data Dictionary • Data Schema • System Demo Support • Equipment Operations Manuals • Maintenance Manuals • Problem Resolution Support

STAT

Figure 5.7.1-1. Training Organization and Responsibilities

5.7.2 Methodology

Our training methodology is designed to provide NPIC with a comprehensive curricula that is based on a balanced selection of training modes including classroom, computer assisted, independent self-study and on-the-job.

PROCEDURES COOPERATIVELY DEVELOPED -- Our training methodology incorporates and integrates, in a balanced and complementary fashion, various modes of training, to suit the needs of NPIC personnel. For system users, it will be available on all shifts and will be personalized to satisfy unique application areas. Classroom training will be the predominate mode of training used. Training segments that are well structured will be developed using the computer assisted instruction (CAI). This personalized mode of training will also be used for skill development and practice situations. The classroom and CAI training modes will be augmented by a self-study program in those areas where personal orientation and memorization is required. Finally, the trainees will be coached as needed during an on-the-job training period.

We will provide training for all members of the computer operations, system programmer and support, data base administration (DBA) and software maintenance staffs. We will also provide training for the NPIC instructors who will in turn train the D/C Segment System users.

Figure 5.7.2-1 shows the system users divided by functional areas. The specific courses planned for each training category plus estimates for number of trainees is found in Figure 5.7.2-2. The procedure for developing training materials for NPIC system users consists of the following steps:

a. Collect Data - The training organization will gather inputs on D/C Segment functions, command and control functions, integrated work station procedures, configuration management and software management. From these inputs, lists of subjects will be developed to serve as guidelines for training material development. Inputs for training needs will also be collected from the other segments and the SI contractor.
b. Develop Syllabus - From the subject lists, a syllabus for each curriculum will be developed detailing subjects that each trainee must learn.
c. Review Training Materials - The training organization will review the course material outlines with NPIC training specialists to ensure a proper balance of emphasis in selected functions.
d. Develop Training Materials - Based on approved course material outlines, training materials for Government instructors and system users will be developed. These materials will consist of, but not be limited to, lecture outlines, individual self-study courses, visual aids and problem exercises.
e. Evaluate Training Materials - A test scenario will be developed and administered to a small selected group to validate the scenario. The Test Training sessions will be evaluated by administering a proficiency exam to the participants.
f. Modify Training Materials - An internal evaluation of the test results will be conducted and, if necessary, corrections made to materials or procedures and the test procedure performed again, on a different group, with subsequent evaluation of the results.
g. Review Test Results With NDPO - Results and corrective measures taken for all testing will be reviewed with NPIC management prior to finalizing the preparation training materials.

h. Develop Training Schedule - A schedule will be developed and will identify the necessary training that NPIC personnel will require based on their job position and time availability.

i. Conduct Training - Several NPIC staff members will receive training directly from hardware/software vendors. These individuals will be scheduled into classes as required. NPIC instructors will conduct training classes on site for all identified system users.

j. Administer Proficiency Exams - At the completion of the training cycle for each individual, a proficiency exam will be administered to determine the level of expertise attained.

k. Evaluation of Exam Results With NDS Management - The proficiency exam results will be jointly evaluated with NDPO to determine trainees' capabilities vs. requirements and changes to the training program will be made as necessary and recommended course of action.

TRAINING RESOURCES AND MODES -- The computer resource that will be used by the training function will be the training/backup computer at the site. The training function will require two fully equipped classroom (30 terminals each with audio/visual equipment) at the NPIC, capable of accommodating up to 30 students each, available on all three shifts. Four basic training techniques will be utilized for all training activities. They are Computer Assisted Instruction (CAI), Independent Study Courses, On-The-Job training (OJT) and classroom lecture. Classroom lecture will be used as the primary technique for imparting information to trainees and OJT will develop the skills acquired during training. CAI shall be used to aid NPIC insturctors in training system users to use both new software and hardware. The CAI instruction will consist of both a tutorial and hands-on concept. The tutorial aid will lead the trainee through the use of the new hardware employed for the integrated work stations and provide immediate feedback on the acquisition of individual work skills. Once the trainee has become familiar with the new hardware they will perform hands-on exercises using scenarios reflecting mission based software. The hands-on concept will require the trainee to operate actual mission software on a test data base to resolve problems presented by test scenarios. In these scenarios, trainees will be required to perform functions identical to normal work related problems against a test data base. Independent Study Courses will be used for staff members to reinforce learning or as a refresher training technique.

SYSTEM USER CATEGORIES	
Functional Area	System Users
Exploitation	• Imagery Analyst • IA Supervisor
Exploitation Support	• Exploitation Engineer • Image Scientist • Intelligence Analyst • Intelligence Officer • Visual Info. Specialist
Exploitation Reporting	• Cable Authenticator • Editor • Graphics Designer
General Support	• Document Control • Film Control • Intelligence Officer • Research Analyst • Research Manager • Requirements Officer

Figure 5.7.2-1. System User Categories

Tailored Courses will be Given to Satisfy the Training Needs of Each NDS Skill Category.

Training Categories	Number Trainees			Courses Planned
	BOC	IOC	FOC	
NPIC Instructors	20	30	30	• Terminal Operation • Textual Data Review • Textual Data Entry • Report / Cable Generation • Report & Cable Edit • User File Maintenance • General Exploitation Support
System Users*	750	1000	1000	Same as for NPIC Instructors
Computer Operators	15	20	20	• Introduction to MVS Facilities • Equipment Operation • NDS Command & Control Function • Scheduling, Monitoring & Execution
Data Base Administration	5	5	5	• Programmers User Language • Host Language Interface • Data Base Design • File Management • System Management
Maintenance & Support	10	10	10	• Introduction to H/W Architecture • Introduction to MVS • VS JCL & Utilities • Multi Programming Service • VSAM • TCAM • CICS • CPCI Mapping & Functions • Software Dev. & Maintenance • IWS Maintenance • H/W & S/W Configuration Management

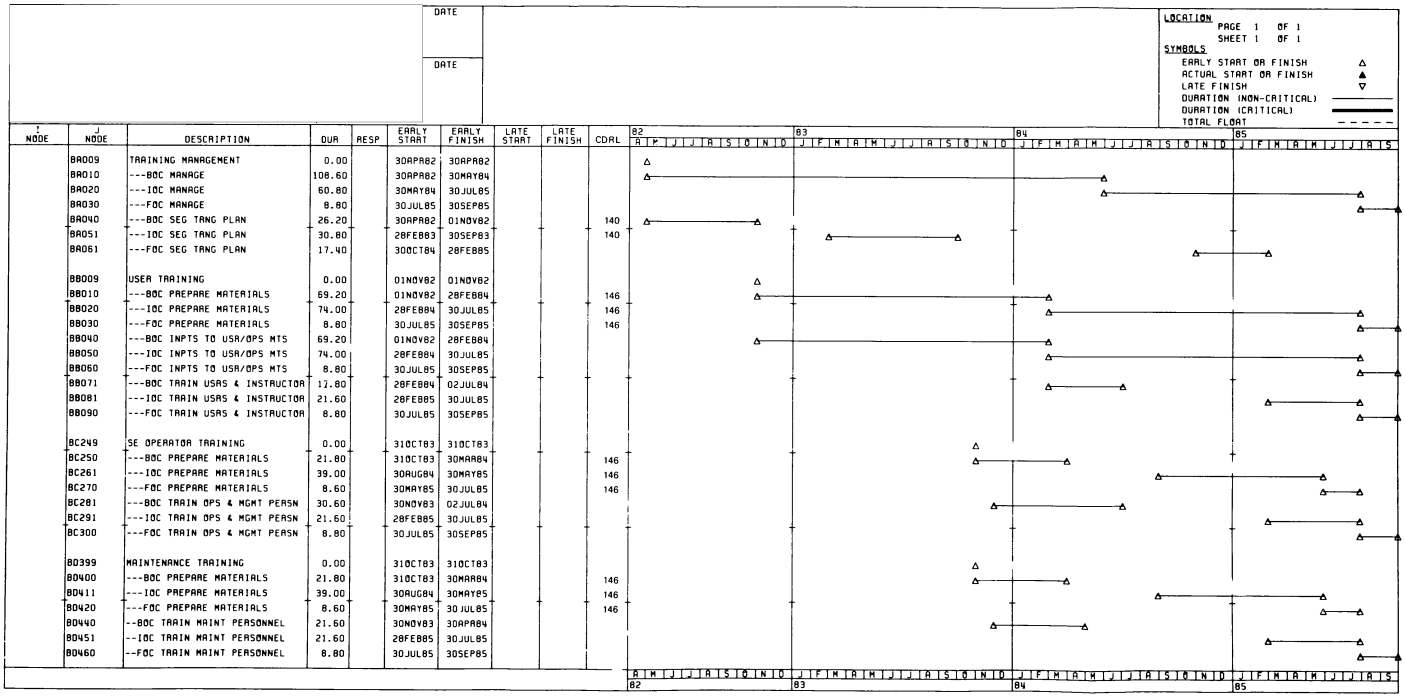
*System Users Trained by NPIC Instructors

Figure 5.7.2-2. Training Courses

5.7.3 Activity Plan

The training schedule is consistent with the major milestones in the master schedule and is designed to provide the necessary training for NPIC personnel in a timely manner.

As shown in Figure 5.7.3-1 a training schedule is defined that accounts for each aspect of Training called for in the WBS and SOW. Training milestones have been established for each stage of the D/C Segment, i.e. BOC, IOC and FOC.



I NODE	J NODE	DESCRIPTION	DUR	RESP	EARLY START	EARLY FINISH	LATE START	LATE FINISH	CORL
	BA009	TRAINING MANAGEMENT	0.00		30APR82	30APR82			
	BA010	---BOC MANAGE	108.60		30APR82	30MAY84			
	BA020	---IOC MANAGE	60.80		30MAY84	30JUL85			
	BA030	---FOC MANAGE	8.80		30JUL85	30SEP85			
	BA040	---BOC SEG TRNG PLAN	26.20		30APR82	01NOV82			140
	BA051	---IOC SEG TRNG PLAN	30.80		28FEB83	30SEP83			140
	BA061	---FOC SEG TRNG PLAN	17.40		30OCT84	28FEB85			
	BB009	USER TRAINING	0.00		01NOV82	01NOV82			
	BB010	---BOC PREPARE MATERIALS	69.20		01NOV82	28FEB84			146
	BB020	---IOC PREPARE MATERIALS	74.00		28FEB84	30JUL85			146
	BB030	---FOC PREPARE MATERIALS	8.80		30JUL85	30SEP85			146
	BB040	---BOC INPTS TO USR/OPS MTS	69.20		01NOV82	28FEB84			
	BB050	---IOC INPTS TO USR/OPS MTS	74.00		28FEB84	30JUL85			
	BB060	---FOC INPTS TO USR/OPS MTS	8.80		30JUL85	30SEP85			
	BB071	---BOC TRAIN USRS & INSTRUCTOR	17.80		28FEB84	02JUL84			
	BB081	---IOC TRAIN USRS & INSTRUCTOR	21.60		28FEB85	30JUL85			
	BB090	---FOC TRAIN USRS & INSTRUCTOR	8.80		30JUL85	30SEP85			
	BC249	SE OPERATOR TRAINING	0.00		31OCT83	31OCT83			
	BC250	---BOC PREPARE MATERIALS	21.80		31OCT83	30MAR84			146
	BC261	---IOC PREPARE MATERIALS	39.00		30AUG84	30MAY85			146
	BC270	---FOC PREPARE MATERIALS	8.60		30MAY85	30JUL85			146
	BC281	---BOC TRAIN OPS & MGMT PERSN	30.60		30NOV83	02JUL84			
	BC291	---IOC TRAIN OPS & MGMT PERSN	21.60		28FEB85	30JUL85			
	BC300	---FOC TRAIN OPS & MGMT PERSN	8.80		30JUL85	30SEP85			
	BD399	MAINTENANCE TRAINING	0.00		31OCT83	31OCT83			
	BD400	---BOC PREPARE MATERIALS	21.80		31OCT83	30MAR84			146
	BD411	---IOC PREPARE MATERIALS	39.00		30AUG84	30MAY85			146
	BD420	---FOC PREPARE MATERIALS	8.60		30MAY85	30JUL85			146
	BD440	--BOC TRAIN MAINT PERSONNEL	21.60		30NOV83	30APR84			
	BD451	--IOC TRAIN MAINT PERSONNEL	21.60		28FEB85	30JUL85			
	BD460	--FOC TRAIN MAINT PERSONNEL	8.80		30JUL85	30SEP85			

Figure 5.7.3-1. Training Activity/Schedule

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Section 6

PERSONNEL

6.1 Key Personnel

The [redacted] team has identified 59 project positions that require dedicated assignment STAT *for the full SAP performance period. We have filled these positions with experienced, qualified people and will commit them to NDS under key personnel clauses.*

Figure 6.1-1 lists the 59 key positions we have identified and the people we have assigned to these positions. We will commit these key personnel under the "Key Personnel Clause" of the contract. Full resumes of these key personnel are provided in Appendix B-2.

KEY PERSONNEL WILL BE 100% COMMITTED -- The selected key personnel are the managers and technical leaders who have been delegated responsibility for meeting our NDS commitments. We have given them the necessary authority and resources to achieve all project objectives. Twenty-five percent key personnel are technical specialists who have played important roles in the development of our technical approach. We have designated them as "key personnel" because of their experience on NDS and the technical leadership they bring to the SAP.

We are prepared, as the project evolves, to submit key personnel clauses for additional positions that require dedicated assignments. During 3rd quarter FY83, for example, when our software development organization will reach its peak staffing, we will designate seven additional, subordinate software managers as key personnel. In addition, as their clearances are completed we will cover several other non-managers by key personnel clauses.

Key personnel will be 100% committed and they will have no other assignments. They will not be transferred to another assignment without the consent of the NDPO. Should a transfer be necessary, we will provide advance notification of at least 30 days. In each case, we will designate a suitable replacement and determine any impact on the project.

KEY PERSONNEL WERE CAREFULLY SELECTED -- The key personnel comprise a stable, senior level team, all of which have worked on the DCP and the SAP proposal. On the average, the [redacted] have 21 years of relevant experience, 16 of which has been with [redacted] STAT of the key personnel understand the requirements of the project and have participated in developing our solution and technical approach.

Of the 59 key personnel, 47 are currently cleared for NDS. Applications for the remaining 12 are in process. If a clearance is not received by contract start, an alternative manager or technical specialist will fill the position on an interim basis.

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CRITICAL D/C SEGMENT FUNCTION		ARANCE SCI-N SUBM.	PRIMARY RESPONSIBILITY
1. Project Manager		X	Overall respon. for NDS D/C Segment
2. Deputy Project Mgr.		X	NDPO interface/Proj. Commitments
3. Proj. Control Office		X	Control of project status & visibility
4. Subsystem Acquisition		9/81	Overall subcontract mgmt. and control
5. System Engineering		X	SEMP and component activities
6. Requirements Analysis		X	Reqmts analysis, sys trades specs
7. Design		X	Development & interface specs
8. Operations		X	OPS concept, user manuals, & O&M plans
9. Comm & Interface Cntl.		X	Intersegment interface definitions
10. Sys Engrg Specialist		X	Sizing & capacity of sys architecture
11. Segment Development		X	Development of all HW & SW
12. IWS/HW Development		2/82	Prepare IWS design spec & monitor IWS Dev.
13. HW Specialist		X	Hardware design
14. SW Development		X	Overall SW development management
15. SW Engineering		X	SW architecture and data base spec
16. SW Control		11/81	Libraries, SW builds, & CM
17. CPCI Development		12/81	CPCI's from design through O&M
18. SW Specialist		X	CPCI Design and development
19. SW Specialist		X	SW Segment of system design spec
20. SW Specialist		X	Data base design and implementation
21. Development & Test Lab		2/82	Installation & operation of DTL
22. Int., Test & Transition		X	Transition, testing, training, and O&M
23. Training		11/81	Training plan and material development
24. Transition Planning		7/81	Test, Facilities, Install. Plan
25. Integration & Test		9/81	Test tools, plans, & proceds.
26. O&M		1/82	Maintenance and logistics plan
27. Product Assurance		10/81	HQA & SQA plans & audits
28. Security		X	Compliance with NDS security stnds
29. [redacted] Project Manager		X	Overall respon. for [redacted] subcontract
30. [redacted] Deputy Proj. Mgr.		X	Daily tech. coord., review & control
31. System Engineering		X	Trans. & Int. plans, CPCI Part 1
32. Software Development		X	Development of Part 2 specs
33. Testing & Verification		SCI	Factory and site test plans
34. Training		SCI	Trnng. Plans & Materials
35. Installation Support		X	Test & integ., shppng & instl. plans
36. Quality Assurance		X	SDRL - Quality Assurance
37. Site Test & Demonstrati		X	Transition Planning
38. Systems Engrg. Specialis		X	Systems Analysis Specialist
39. Systems Engrg. Specialis		X	Data Base Specialist
40. Systems Engrg. Specialis		X	System Analysis Specialist
41. [redacted] Project Manager		X	Overall respon. for [redacted] IWS prog.
42. [redacted] Deputy Project		X	Technical guidance on IWS
43. Subsystem Engineering		X	Design and Development of IWS
44. HW Development & Acq.		X	Part 2 specs and CPCI development
45. Integ., Test & Install.		X	Integration and installation IWS
46. Software Development		X	IWS SW Development
47. System Engrg. Specialis		X	IWS SW system engineering
48. System Engrg. Specialis		X	IWS SW system engineering
49. System Engrg. Specialis		X	IWS system engineering
50. SW Specialist		X	Software to hardware interface
51. SW Specialist		X	IWS SW development
52. HW Engineer		X	IWS Comp. Acquisition
53. [redacted] Project Manager		X	Overall respon. for [redacted] Subcontract
54. [redacted] Deputy Proj. Manage		X	Technical quidance on Preexpolitation
55. SW Development		X	Development of Part 2 spec.
56. Sys. Design & Perf. Ana		X	Modelling and simulation requirements
57. Rqmts. & Traceability		X	Rqmts., traceability & verif. matrix
58. SW Development		X	SW development CPC task leader
59. Comm. Task Leader		X	Communications interface

Figure 6.1-1. Key Personnel Committed To D/C Segment Project

6.2 Staffing and Clearance Plan

The staffing requirements for the D/C Segment have been carefully determined and the [redacted] team has identified and reserved all required personnel by name to perform on this contract. STAT

Based on the task requirements specified in the project plans and the Cost Proposal, we have structured a staffing profile as shown in Figure 6.2-1. Project personnel were separated into four major skill areas:

a. Project Management - This category includes the Project Manager, his staff, all personnel in the Project Control Office, Security, Quality Assurance, Subcontractor Management, documentation development, configuration management, and all administrative support.
b. System Engineering - Includes all system engineering personnel supporting requirements analysis, design, operations and communications/interface control.
c. Development - Includes all personnel performing either hardware and software development on CPCIs or the IWS.
d. Support - Includes integration, test and verification, transition, installation, training, Development and Test Laboratory and Facility planning.

Every individual selected for NDS is either currently working on DCP, or has been redirected from other projects based on a firm backfill plan in place to assure availability to NDS.

INITIAL STAFFING REQUIREMENT -- We project a staffing requirement at contract start of 166 personnel. These individuals include the 59 Key Personnel identified in Section 6.1. In addition, 127 personnel have identified and committed to this project at contract start on May 1, 1982. Of these 166 personnel, 72% (120) currently possess SCI-N clearances and of the remaining 46, all clearance papers have been submitted - (23 currently possess SCI or equivalent and 23 require an extended background investigation). We project all of these individuals will be cleared during the 3rd quarter of FY82.

All personnel are dedicated to this project 100% with the exception of the eight personnel supporting the Development and Test Facility. It is not envisioned that the lab operation will require full-time support early in the contract and therefore DTL personnel are assumed to average 50%.

PEAK STAFFING REQUIREMENTS -- The critical staffing levels are projected in the fourth quarter of FY83. The project will reach a maximum level of 380 personnel. We have identified personnel to fill each position who are either employees of [redacted] or one of the subcontractors. The projects they are currently working on are phased such that they should be available for NDS as our staffing requirements increase. If an individual can not be made available due to changes in these other projects, NDS staffing requirements will be satisfied by a substitute with equal qualifications. We will track these other projects and update our staffing list quarterly. Of this total 34% (130) already possess SCI-N clearances, 22% (85) possess SCI or equivalent and can be crossed-over to SCI-N expeditously, and the remaining 165 either have clearance papers in progress or will have them in progress in time to meet peak staffing requirements. In order to take full advantage of the systems design expertise during peak development activity in 3Q FY83, approximately 18 SE's with S/W expertise will be assigned to S/W development. STAT

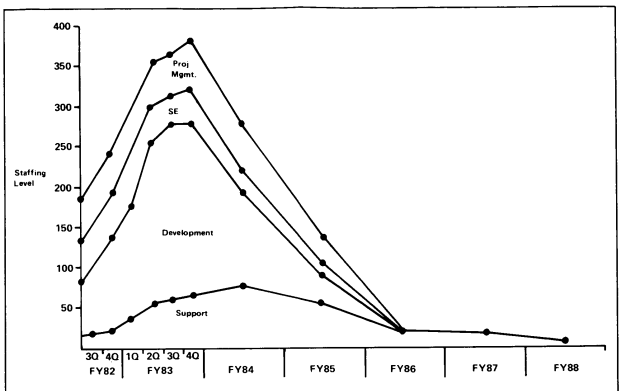
PERSONNEL IDENTIFIED BY SKILL AND LEVEL -- Each individual planned for this project is specifically identified in Figures 6.2-2 (Project Management), 6.2-3 (Systems Engineering), 6.2-4 (Development) and 6.2-5 (Support). These figures show the level, key personnel designation, availability date, DCP experience, clearance status and assignment on the SAP. The levels are:

a. "A" -- Personnel, generally with advanced college degrees in engineering, science, mathematics or related disciplines; minimum of 10 years professional experience directly applicable to data handling systems definitions or development; demonstrated degree of technical creativity/management ability.
b. "B" -- Personnel, generally with advanced college degree in engineering science, mathematics or related disciplines; 5-8 years professional experience directly applicable to data handling systems; demonstrated leadership ability.
c. "C" -- Personnel, generally with a college degree or equivalent in engineering, science, mathematics or related disciplines; less than 5 years experience or speciality training directly applicable to data handling systems.
d. "D" -- Administrative and support personnel (non-exempt).

The fiscal year profile for the staffing plan categorized by skill and level is shown in Figure 6.2-6.

CAREER MANAGEMENT AUTHORITY AND REPORTING RESPONSIBILITY -- As described in Section 3, all [redacted] on the project (with the exception of Product Assurance and certain staff functions such as Contracts) organizationally are under the control of the Project Manger [redacted] In this capacity, he is also responsible for their career management. For the software development personnel, he shares career management responsibility with [redacted] manager of Software Development [redacted] is a member of the Technical Advisory Council and played a major role in selecting personnel for the project. He will see to it that the assigned people all understand the technical and career opportunitities the project presents and will assure their availability at the appropriate start dates.

Our subcontractor's personnel report directly to their respective project managers. Career management is provided by the project managers and the senior vice president and advisory council members to whom the managers report.



	START	FY82 3Q	FY82 4Q	FY83 1Q	FY83 2Q	FY83 3Q	FY83 4Q	FY84	FY85	FY86	FY87	FY88
PM[1]	37	48	54	54	59	57	57	55	34	7	7	4
SE[2]	48	56	56	47	47	44	44	26	15	–	–	–
DEV[3]	65	65	114	138	199	209	208	118	33	1	–	–
SPT[4]	16	16	21	37	55	59	71	76	54	14	11	7
Totals	166	185	245	276	360	369	380	275	136	22	18	11
Cleared Personnel	166	169	240	276	360	369	380	275	136	22	18	11

(1) PM Includes Project Management, Project Control Office & Administrative Support
(2) SE Includes All Systems Engineering Tasks
(3) DEV Includes Both H/W and S/W Development
(4) SPT Includes Testing, Verification, Transition, Installation, DTL, Training and O&M.

Figure 6.2-1. Staffing Profile

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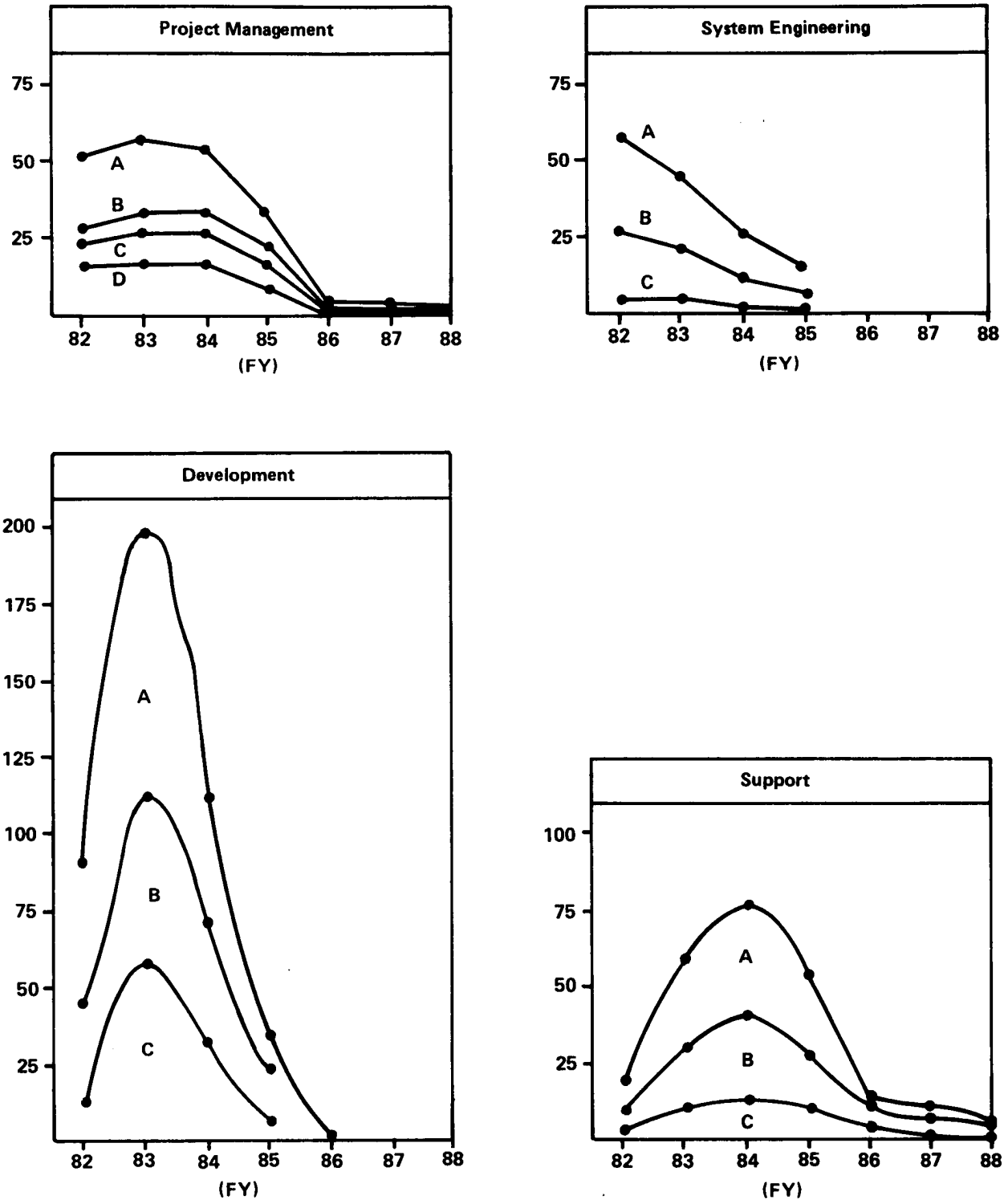

Figure 6.2-6. Staffing Plan By Skill and Level

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EXPERIENCE AND PAST PERFORMANCE

Section 7

EXPERIENCE AND PAST PERFORMANCE

The [redacted] Team has extensive experience in development of large, complex systems, acquired in over 28 years of successful performance on programs with characteristics similar to NDS. STAT

[redacted] and its principal subcontractors, [redacted] have the prerequisite experience and records of successful past performance on a broad range of system applications for many government organizations. Included in our experience base is a large number of programs for the Intelligence Community, starting as far back as March 1959, with the prototype of the Intelligence Data Handling Systems at Headquarters, Strategic Air Command. That system involved the development of the Formatted File System, probably the first DBMS installed on a commercial computer. In addition to our years of experience in numerous IDHS programs, we have been and still are involved in diverse Collection, Processing and Production systems. Because of special security compartment restrictions these are not covered extensively in this related experience section, but information can be made available under proper security conditions and with permission of the agencies involved. STAT

The seven projects described in the following pages were chosen because of their correlation to NDS with respect to: (1) size, (2) scope, (3) technical performance and (4) methodologies employed. These programs exemplify past performance and experience of the [redacted] team and demonstrate our exceptional ability to satisfy all NDS objectives. STAT

Our experience and past performance are summarized in Figure 7-1. A detailed description of each of the seven selected programs follows. This includes the formal cost, schedule, technical performance and contracting officer's name, address and telephone number. Also included in the figure are ten additional programs which further demonstrate the extensive relevant experience of the [redacted] team; however, space limitations have precluded more complete discussions in this section. STAT

7.1. Launch Processing System (LPS)

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CONTRACT NUMBER: STAT
TOTAL DOLLAR VALUE:
PROCURING AGENCY:
PERIOD OF PERFORMANCE: 5/74 - 9/84
TYPE OF CONTRACT: CPAF

STAT

DESCRIPTION & RELEVANCE OF PROGRAM

LPS is a network of distributed processors configured to perform mission preparation and online management in support of the space shuttle vehicle, payloads and boosters. LPS consists of eleven autonomous launch processing sites: each with up to 64 minicomputers, with associated mass storage, control consoles, and communication facilities. is responsible for the design, programming, and system integration of STAT system. LPS has approximately 1.8 million instructions in the minicomputer operating system and support software.

TECHNICAL PERFORMANCE

a. The developed LPS has provided better than 99.9% availability. STAT
b. The distributed minicomputer system grew from 27 to 41 with no change in developed software. The system has the capability to grow to 64 miSTAT computers; 41 were used in recent Shuttle launch support.
c. A common operating system and system architecture exist for all computers in the system. Applications are not restricted to a specific mini-computer.
d. Since initial installations, over 50 major specification changes were transitioned into the system without interruption of testing. The system was also transitioned to the Vandenberg (VLPS) Shuttle site.
e. The LPS system has flawlessly supported the first two Shuttle launches.

SCHEDULE PERFORMANCE

All software releases were delivered on schedule and met requirements.

COST PERFORMANCE

Cost has been managed within contract cost objectives. An award fee evaluation of "Superior" has been received in nearly every evaluation. Based on technical and cost objectives, 100% of the available award fee has been received.

7.2 Shuttle Data Processing Complex (SDPC) [redacted] STAT

CONTRACT NUMBER: [redacted] STAT
TOTAL DOLLAR VALUE:
PROCURING AGENCY:
PERIOD OF PERFORMANCE: 7/74 - 6/81
TYPE OF CONTRACT: CPAF

[redacted] STAT

DESCRIPTION & RELEVANCE OF PROGRAM

SDPC evaluates space vehicle performance in real time and computes vehicle system commands, navigation data, and maneuver and targeting data for onboard systems. SDPC upgraded the Apollo Real-Time Computer Complex (RTCC) for Shuttle requirements, replacing five [redacted] System/360 Model 75s with three [redacted] System/370 Model 168s. [redacted] responsibility includes definition, development, maintenance, and operational support for: all command and control and support software to be executed within the SDPC and to support the JSC Payload Operations Control Center; maintenance of the Software Development Laboratory Flight Equipment Interface Device equipment and on-call maintenance of the MCC S/360 and S/370 computers; and support to NASA JSC earth resources and Shuttle mission planning activities. STAT

The Apollo RTSS, using five [redacted] 7094s, became operational in Houston midway through the Gemini program, transitioning from Goddard to the Johnson Space Center. The computers were replaced with five [redacted] System/360 Model 75s, and the software was expanded to accommodate the Apollo Lunar Mission, Skylab and Apollo-Soyuz. The Shuttle required additional capability, which resulted in transitioning to the SDPC without disruption of ongoing operations. STAT STAT

TECHNICAL PERFORMANCE

a. Redundant computer and rapid software reconfiguration capabilities combine to satisfy 0.9995 mission-critical reliability requirement.
b. The application software was designed to handle NASA's evolving requirements from initial Orbiter checkout through mature Space Transportation System operations.
c. NASA has consistently rated technical performance "Excellent" in periodic award fee evaluations

SCHEDULE PERFORMANCE

2.3 million lines of software were delivered on schedule.

COST PERFORMANCE

a. Contract performance has been consistently under target costs.
b. NASA rating of [redacted] performance has been consistently "Excellent". [redacted] has earned approximately 98% award fee. STAT

7.3 Applications Development & CAMS [redacted] STAT

CONTRACT NUMBERS: [redacted] STAT
TOTAL DOLLAR VALUE:
PROCURING AGENCY: CIA
PERIOD OF PERFORMANCE: 10/63 - 9/82
TYPE OF CONTRACT: CPFF

[redacted] STAT

DESCRIPTION & RELEVANCE OF PROGRAM

Through the Application Development Software contract, [redacted] is responsible for the development of software for various Office of Data Processing (ODP) customers. This responsibility includes definition, development and maintenance of: STAT

a. Graphic software for the Cartographic Design Center, NFAC, including the Cartographic Automated Mapping (CAM) system, publication graphics and on-line interactive editing of x-y data;
b. World Data Banks I, IA, II and special Data Banks editing and update programs;
c. COMIREX application for outlining clusters of adjacent grid cells;
d. Message Processing System to distribute cable traffic in real time to ODP customer.

In 1975 CAMS started as a task under the Applications contract. [redacted] was responsible for the development of new capabilities to satisfy desired requirements and enhancements to CAMS I, including analysis of user requirements and system design, software development, user testing, documentation and maintenance of software to meet new and changing user requirements. STAT

TECHNICAL PERFORMANCE

[redacted] delivered three major upgrades to CAMS--one in September, 1978; another in June 1980; and the third in January 1981. CAM I has over 450 PL/I modules and over 500K lines of code. STAT

SCHEDULE PERFORMANCE

a. Consistent excellent fees reflect strong customer satisfaction with [redacted] adherence to delivery schedules and technical performance. STAT
b. COMIREX external requirements have caused numerous tight schedules.

COST PERFORMANCE

Contract performance has been consistently under target costs.

7.5 ASG

STAT

CONTRACT NUMBER:
TOTAL DOLLAR VALUE:
PROCURING AGENCY:
PERIOD OF PERFORMANCE: 1971-1980
TYPE OF CONTRACT: CPFF & CPAF

STAT

STAT

DESCRIPTION & RELEVANCE OF PROGRAM

ASG was initially a combination of consecutive studies and analyses addressing a material handling system and the storage alternatives for a major data file and a microfilm design study. Subsequent efforts increased in scope to nearly all phases of the system development process. Assistance was provided for planning, acquisition, and implementation of a centralized large-scale on-line computer system, centered upon a Univac 1100/44 configuration (EXEC 8 and DMS 1100) with an interactive terminal network. Overall applications software architecture was developed, acceptance testing and evaluation of application software, system integration, and user training was performed. Software was developed for conversion of two national files.

TECHNICAL PERFORMANCE

a. Timely conversion of national files allowed transition from obsolete and costly system procedures.
b. Operational strategies developed for contingencies assured support of external interfaces at IOC.
c. Comprehensive test planning and procedures demonstrated timely compliance with segment and inter-segment schedules.
d. A carefully planned and executed training program minimally impacted operations and prepared users properly for initial operations.

SCHEDULE PERFORMANCE

All products were delivered on schedule and met requirements.

COST PERFORMANCE

Cost was managed within budget. All award fee evaluations ranged from excellent to outstanding and 100% of the available award fee was received.

7.6 Battlefield Exploitation/Target Acquisition (BETA) Test Bed

STAT

CONTRACT NUMBER:
TOTAL DOLLAR VALUE:
PROCURING AGENCY:
PERIOD OF PERFORMANCE: Apr 77 - Apr 81
TYPE OF CONTRACT: CPIF

STAT

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DESCRIPTION & RELEVANCE OF PROGRAM

The BETA Test Bed is a system to develop and evaluate capabilities for near real time tactical fusion of intelligence data for targeting, threat warning and support of battle management. The test bed consists of correlation centers for the Air Force and Army, a communications subsystem and a suite of sensors associated with each correlation center. Involved are: complex system integration, software development, intelligence application knowledge, and performance evaluation.

TECHNICAL PERFORMANCE

STAT developed test support evaluation software, exercise support simulations and a communications support plan for exercises in CONUS and Europe. STAT was responsible for the design, development, test, and maintenance of all the self-correlation, query, and test and evaluation software; developed to MIL-STD-490 format programs containing 120,000 lines of S-FORTRAN code. STAT was also responsible for development and documentation of applications software, BETA Log File Processing Software to support evaluation of system performance, computer program configuration management and program library control, integration and test of the entire software system, and integration and test of all system hardware and software.

STAT

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Technical performance on this program was considered exceptional by both STAT and the Joint Project Office (JPO).

SCHEDULE PERFORMANCE

All program objectives were met on schedule.

COST PERFORMANCE

Contract performance was completed under target cost.

7.7 AFSCF/Computer Program Integration Contractor (CPIC) [redacted] STAT

CONTRACT NUMBER: [redacted] STAT
TOTAL DOLLAR VALUE:
PROCURING AGENCY:
PERIOD OF PERFORMANCE: October 1976 - November 1981
TYPE OF CONTRACT: CPFF, FPI/LOE

[redacted] STAT

DESCRIPTION & RELEVANCE OF PROGRAM

[redacted] provides Computer Program Integration Contractor (CPIC) support services to t STAT
Air Force Satellite Control Facility (AFSCF). These integration and operational
services have been continuously provided the AFSCF by [redacted] since 1961. Services STAT
include the following: Data System Engineering; Data System and Computer Program
Requirements Specification; and Data System Interfaces. Involved are: large complex
software and hardware integration; transition into operational environment without
disruption.

TECHNICAL PERFORMANCE

[redacted] has integrated computers and computer products into the operational environme STAT
of the AFSCF--elements procured by various AF SPOs and delivered by a large number
of vendors. There are an average of 12-15 major deliverables each year, and there
has never been a satellite lost or a degradation of operational support due to
products tested and certified by [redacted] STAT

MANAGEMENT PERFORMANCE

The [redacted] contract is for a level of effort with task priorities established by the STAT
after schedules are mutually concurred upon and coordinated. With many different
satellite SPO's requiring a wide variety of services from [redacted] it has been necess STAT
to develop a project management approach to satisfy these needs within a highly
restricted budget. [redacted] has maximized the support it renders the AF within the STAT
restricted funding by establishing a strong CPIC project management structure with a
significant planning and performance evaluation capability back up by a strong
coordination effort.

COST PERFORMANCE

The [redacted] CPIC contracts have always been CPFF, or FPI, level-of-effort, and [redacted] co STAT
performance has been excellent with an average cost deviation of less than 1.7
percent.

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Section 8

ALTERNATIVE MANAGEMENT APPROACHES

Alternative management approaches have been developed to reduce the risk and cost associated with meeting D/C Segment milestone requirements for each programmatic technical/transition option described in Section 10 of the Technical Proposal.

We have analyzed the 14 technical approaches to D/C Segment transition which are described in Section 10 of the Technical Proposal. These alternatives were derived from either eliminating imagery support at IOC or retaining UNIVAC 1100/8X and UNIVAC 1100/84 processors through IOC. We have concluded that cost and risk savings may occur in three management related areas:

a. H/W and S/W Development and staffing plans,
b. IWS Configuration.
c. Project facilities Requirements.

Figures 8.0-1, 8.0-2, and 8.0-3 summarizes each of these areas respectively, including the alternative management approach, and its cost and risk impact for each of the technical/transition options. All other areas of our management approach do not change under any of the options.

TRANSITION ALTERNATIVES -- For each area, the 14 technical alternatives are repeated. Each of the technical issues are analyzed to determine its alternative management option, cost impact and risk impact. The 14 alternatives fall into the following major groupings: alternatives A1-A9, which introduce an [redacted] 3081 processor to support pre-exploitation functions at BOC; and alternatives B1-B5, which utilize UNIVAC processors through IOC. No alternatives include wide-band communications (i.e. CID support) capability at IOC, since this would not promote the desired cost and risk reduction goals. STAT

A complete description of the 14 alternatives can be found in Section 10 of the Technical Proposal.

SOFTWARE DEVELOPMENT AND STAFFING PLANS -- Options A1-A3 and B1-B3 all provide substantial deferral of software development to Post IOC and therefore reduce software development staffing requirements. The software deferral is required to perform exploitation at the work station. There is less risk of achieving the BOC/IOC milestones because of the decline in the software development effort. Alternatives A8, A9, B4, and B5 require increased software development activity after IOC. In A8 and A9 exploitation software is being performed in the [redacted] host and would have to be developed in the IWS after IOC. In B4 and B5 download software (required for exploitation at the IWS) would need to be converted from UNIVAC to an [redacted] host after IOC. STAT STAT

SELECTION OF AN IWS SUPPLIER/SUBCONTRACTOR -- For each of the 14 alternatives an attempt was made to maintain a [redacted] budget goal. Alternatives A1-A3, A7-A9 and B1-B5 are contained within this budget. All other alternatives were over the [redacted] mark but did not exceed a total cost of [redacted] In options A1, A7, and B1 all terminals would be supplied GFE. This would allow us to reduce our bid to NPIC but would not affect total program cost. STAT STAT STAT

PROJECT FACILITY REQUIREMENTS -- Software development facilities for options A1-A9, which require the use of [redacted] processors, would be located at [redacted] Software development facilities for alternatives B1-B5, which provide for the use of only UNIVAC processors may be located at [redacted] or NPIC. Both approaches are discussed in Figure 8.0-3 with our preferred solutions favoring the SW Development facility at [redacted]

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Sharing the NPIC 1100/8X at [redacted] for software development and testing realizes a large cost saving in field burden rates being applied to the labor; however, NPIC's cost of GFE greatly increases as does the risk of intra-project communication and turnover due to the long-term extra length commute.

Sharing the 1100/8X in these alternatives would also necessitate utilizing the 1100/8X in both an operational and development mode, which would significantly degrade overall performance.

MANAGEMENT OPTION (H/W DEVELOPMENT, S/W DEVELOPMENT, STAFFING PLAN IMPACT)				
Programmatic Technical/ Transition	Alternative Management Option	Cost Impact	Risk Impact	
A1—DD Term. Solution for BOC/IOC, UNIVAC UNIVAC Configuration	• No IWS Software for IOC	• No 3033 Cost • Defer 1056 MM S/W DEV & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV., T&V & Integration	STAT STAT
A2—Introduction of Basic IWS at BOC, No Change at IOC. UNIVAC Configuration	• Minimum IWS Software for BOC & IOC	• No 3033 Cost • Defer 846 MM S/W DEV. & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV., T&V & Integration	STAT STAT
A3—All Basic IWS By IOC. UNIVAC Configuration	• Minimum IWS Software for BOC & IOC	• No 3033 Cost • Defer 846 MM S/W DEV. & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV., T&V & Integration	STAT
A4—Introduction of Basic IWS at BOC, Combination of Basic & Expanded PROC Config.	• No Change	• No Change	• No Change	STAT
A5—DD Term, Solution at BOC, Combination of Basic & Expanded IWS at IOC. 2 ROC Config.	• No Change	• No Change	• No Change	STAT
A6—All Basic IWS at BOC, Combination of Basic & Expanded at IOC PROC Config.	• No Change	• No Change	• No Change	STAT
A7—DD Term Solution for BOC/IOC UNIVAC Configuration at BOC Processors at IOC	• No IWS Software for IOC	• Defer 210 MM S/W DEV and T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W Development, T&V and Integration	STAT STAT
A8—Introduction of Basic IWS at BOC No Change at IOC UNIVAC Configuration at BOC Processor at IOC	• Minimum IWS Software for BOC & IOC	• Additional 846 MM S/W DEV and T&V at FOC	• No Change for IOC • Increased Software Development at FOC	STAT STAT
A9—All Basic IWS by IOC UNIVAC/IBM Configuration at BOC Processor at IOC	• Minimum IWS Software for BOC & IOC	• Additional 846 MM S/W DEV and T&V at FOC	• No Change for IOC • Increased Software Development at FOC	STAT
B1—DD Term. Solution for BOC/IOC 2 UNIVAC PROC. Config.	• No IWS Software for IOC • 40K SLOC Modified vs. Replaced	• No 3081 & 3033 Cost • Defer 1056 MM S/W DEV. & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV., T&V & Integration	STAT
B2—Introduction of Basic IWS at BOC, No Change at IOC. 2 UNIVAC Proc. Config.	• Minimum IWS Software for BOC & IOC	• No 308143033 Cost • Defer 846 MM S/W DEV. & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV, T&V and Integration	STAT
B3—All Basic IWS by IOC. 2 UNIVAC Proc. Config. 2 UNIVAC Proc. Config.	• Minimum IWS Software for BOC & IOC	• No 3081 & 3033 Cost • Defer 846 MM S/W DEV. & T&V	• Higher Probability of Achieving IOC Milestone Due to Less New S/W DEV, T&V Integration	STAT
B4—Introduction of Basic IWS at BOC Expanded at IOC 2 UNIVAC Processor Configuration	• Down Load S/W Required in UNIVAC Host	• 105 Additional MM of S/W DEV.	• No Change	
B5—DD Terminal Solution at BOC, IWS at IOC 2 UNIVAC Processor Configuration	• Down Load S/W Required in UNIVAC Host	• 105 Additional MM of S/W DEV.	• No Change	

Figure 8.0-1. Alternative Development & Staffing Impact

MANAGEMENT OPTION (IWS CONFIGURATION IMPACT)			
Programmatic Technical/ Transition	Alternative Management Option	Cost Impact	Risk Impact
A1—DD Term, Solution for BOC/IOC UNIVAC Configuration	• GFE	• IWS Cost ≤4.2 MIL	• No Control Over Delivery Schedule
A2—Introduction of Basic IWS at BOC, No Change at IOC. UNIVAC Configuration	• Develop IWS	• IWS Cost ≤3.7 MIL	• No Change
A3—All Basic IWS By IOC. UNIVAC Configuration	• Develop IWS	• IWS Cost ≤6.6 MIL	• No Change
A4—Introduction of Basic IWS at BOC, Combination of Basic & Expanded IWS at IOC. 2 Proc. Config.	• Develop IWS	• IWS Cost ≤10.9 MIL	• No Change
A5—DD Term, Solution at BOC, Cobination of Basic & Expanded IWS at IOC 2 Proc. Config.	• Develop IWS	• IWS Cost ≤13.1 MIL	• No Change
A6—All Basic IWS at BOC, Combination of Basic & Expanded at IOC. 2 Proc. Config.	• Develop IWS	• IWS Cost ≤10.9 MIL	• No Change
A7—DD Term Solution for BOC/IOC UNIVAC Configuration at BOC 2 IBM Processors at IOC	• GFE	• IWS Cost ≤4.2 MIL	• No Control Over Delivery Schedule
A8—Introduction of Basic IWS at BOC No Change at IOC UNIVAC Configuration at BOC 2 Processor at IOC	• Develop IWS	• IWS Cost ≤3.7 MIL	• No Change
A9—All Basic IWS by IOC UNIVAC Configuration at BOC 2 Processor at IOC	• Develop IWS	• IWS Cost ≤6.6 MIL	• No Change
B1—DD Term, Solution for BOC/IOC 2 UNIVAC Proc. Config.	• GFE	• IWS Cost ≤4.2 MIL	• No Control Over Delivery Schedule
B2—Introduction of Basic IWS at BOC, No Change at IOC. 2 UNIVAC Proc. Config.	• Develop IWS	• IWS Cost ≤3.7 MIL	• No Change
B3—All Basic IWS by IOC. 2 UNIVAC Proc. Config. 2 UNIVAC Proc. Config.	• Develop IWS	• IWS Cost ≤6.6 MIL	• No Change
B4—Introduction of Basic IWS at BOC Expanded at IOC 2 UNIVAC Processor Configuration	• Develop IWS	• IWS Cost ≤10.9 MIL	• No Change
B5—DD Terminal Solution at BOC, IWS at IOC 2 UNIVAC Processor Configuration	• Develop IWS	• IWS Cost ≤13.1 MIL	• No Change

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Figure 8.0-2. Alternative IWS Configuration Impact

MANAGEMENT OPTION (PROJECT FACILITY REQUIREMENTS IMPACT)			
Programmatic Technical/ Transistion	**Alternative Management Option**	**Cost Impact**	**Risk Impact**
A1—DD Term, Solution for BOC/IOC, UNIVAC Configuration	• No Change	• No Change	• No Change
A2—Introduction of Basic IWS at BOC, No Change at IOC, UNIVAC Configuration	• No Change	• No Change	• No Change
A3—All Basic IWS by IOC. UNIVAC/ Configuration	• No Change	• No Change	• No Change
A4—Introduction of Basic IWS at BOC, Combination of Basic & Espanded IWS at IOC. Proc. Config.	• No Change	• No Change	• No Change
A5—DD Term Solution at BOC Combination of Basic & Expanded IWS at IOC Proc. Config.	• No Change	• No Change	• No Change
A6—All Basic IWS at BOC Combination of Basic & Expanded at IOC. Proc. Config.	• No Change	• No Change	• No Change
A7—DD Term Solution for BOC/IOC UNIVAC Configuration at BOC Processors at IOC	• No Change	• No Change	• No Change
A8—Introduction of Basic IWS at BOC No Change at IOC UNIVAC Configuration at BOC Processor at IOC	• No Change	• No Change	• No Change
A9—All Basic IWS by IOC UNIVAC/ Configuration at BOC 2 Processor at IOC	• No Change	• No Change	• No Change
B1—Delta Data Terminal Solution for BOC/IOC • 2 UNIVAC Processor Configuration	Alternate • All S/W Dev and T/V 213 • No SDL PREFERRED • S/W Dev. & T/V • SDL with UNIVAC 1100/82	Alternate • Min of 3600 MM Labor at Field Rates • No SDL Operational Costs • Smaller SCF Facility by 130 Personnel • 33% S/W Dev. Productivity Loss Due to UNIVAC Resource Availability PREFERRED • Higher S/W Dev. Labor Costs (33%) Due to Lower Productivity on UNIVAC 1100/82	Alternate • Must Provide Facilities & Dev./ test Resources for 120 Personnel • Degraded Intra-Project Comm. • Potential Loss of Some Staff Due to Long-Term, Lenghty Commute PREFERRED • Potential Schedule Risk if UNIVAC S/W Dev., Test, and Management Tools USS Powerful than
B2—Introduction of Basic IWS at BOC • No IWS Change at IOC • 2 UNIVAC Processor Configuration	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factor as B1 Preferred)
B3—All Basic IWS at IOC • 2 UNIVAC Processer Configuration	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)
B4—Introduction of Basic IWS at BOC • Expanded at IOC • 2 UNIVAC Processor Configuration	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)
B5—Delta Data Terminal Solution at BOC • IWS at IOC • 2 UNIVAC Processor Configuration	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)	Alternate (Same Factors as B1 Alternate) PREFERRED (Same Factors as B1 Preferred)

Figure 8.0-3. Alternative Facility Impact

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